PB85-169845

Performance Evaluation of an Improved Street Sweeper

Air Pollution Technology, Inc., San Diego, CA

Prepared for

Environmental Protection Agency
Research Triangle Park, NC

Mar 85

U.S. Department of Commerce
National Technical Information Service
NTIS

PB85-169845

EPA/600/7-85/008
March 1985

PERFORMANCE EVALUATION OF AN IMPROVED STREET SWEEPER

by

Michael Duncan, Roop Jain, Shui-Chow Yung, and Ronald Patterson

A.P.T., Inc.
5191 Santa Fe Street
San Diego, CA 92109

EPA Contract No. 68-02-3902
EPA Acting Project Officer: Dale L. Harmon

Air and Energy Engineering Research Laboratory
Office of Environmental Engineering and Technology
Research Triangle Park, NC 27711

AIR AND ENERGY ENGINEERING RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U.S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA/600/7-85/008	2.	3. RECIPIENT'S ACCESSION NO. PB85 169845 /AS
4. TITLE AND SUBTITLE Performance Evaluation of an Improved Street Sweeper		5. REPORT DATE March 1985
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) Michael Duncan, Roop Jain, Shui-Chow Yung, and Ronald Patterson		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS A. P. T., Inc. 5191 Santa Fe Street San Diego, California 92109		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO. 68-02-3902
12. SPONSORING AGENCY NAME AND ADDRESS EPA, Office of Research and Development Air and Energy Engineering Research Laboratory Research Triangle Park, NC 27711		13. TYPE OF REPORT AND PERIOD COVERED Final; 7/82 - 7/84
		14. SPONSORING AGENCY CODE EPA/600/13

15. SUPPLEMENTARY NOTES AEERL Project Officer William B. Kuykendal is no longer with the Laboratory; for details, contact Dale L. Harmon, Mail Drop 61, 919/541-2429.

16. ABSTRACT The report gives results of an extensive evaluation of the Improved Street Sweeper (ISS) in Bellevue, WA, and in San Diego, CA. The cleaning performance of the ISS was compared with that of broom sweepers and a vacuum sweeper. The ISS cleaned streets better than the other sweepers. Typically, the broom sweepers removed 20% of the street solids, the vacuum sweeper, 70%, and the ISS, 80%. Additionally, the ISS was the only sweeper tested that gave a constant, low level of residual street solids that was independent of the initial amount of street solids. Dust emissions from paved streets can be controlled by street cleaning, but the commonly used broom and vacuum street sweepers are ineffective in removing small particles from the street surface, and they disperse the dust into the air during sweeping. A. P. T. improved a commercial vacuum sweeper under a previous EPA contract and, in earlier limited testing, showed that the ISS cleans streets better and disperses less dust.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Pollution	Pollution Control	13B
Streets	Stationary Sources	
Dust	Vacuum Street Sweeper	11G
Vacuum Cleaners		13G

18. DISTRIBUTION STATEMENT Release to Public	19. SECURITY CLASS (This Report) Unclassified	21. NO. OF PAGES 242
	20. SECURITY CLASS (This page) Unclassified	22. PRICE

EPA Form 2220-1 (9-73)

NOTICE

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

COLOR ILLUSTRATIONS REPRODUCED
IN BLACK AND WHITE

ABSTRACT

Dust emissions from paved streets can be controlled by street cleaning. The commonly used broom and vacuum street sweepers are ineffective in removing small particles from the street surface, and they disperse the dust into the air during sweeping. A.P.T. improved a commercial vacuum sweeper under a previous EPA contract, and in limited testing showed that the Improved Street Sweeper (ISS) cleans the street better and disperses less dust.

In this study, an extensive evaluation of the ISS was carried out in Bellevue, WA and in San Diego, CA. The cleaning performance of the ISS was compared with that of broom sweepers and a vacuum sweeper. The ISS cleaned streets much better than the other sweepers. Typically, the broom sweepers removed 20% of the street solids, the vacuum sweeper removed 70% of the solids, and the ISS removed 80%. Additionally, the ISS was the only sweeper tested that gave a constant, low level of residual street solids that was independent of the initial amount of street solids.

CONTENTS

Page No.

Abstract iii
List of Figures vii
List of Tables x
Nomenclature xi
Acknowledgment xi

SECTION 1 -- SUMMARY 1
    INTRODUCTION 1
    OBJECTIVES 2
    STREET SWEEPER DESCRIPTION 2
    TEST METHOD 4
    RESULTS 5
    CONCLUSIONS 7
    RECOMMENDATIONS 7

SECTION 2 -- INTRODUCTION 8
    PARTICLE EMISSIONS FROM STREETS 8
    DEVELOPMENT OF AN IMPROVED STREET SWEEPER 9
    PROJECT OBJECTIVES 9

SECTION 3 -- STREET SWEEPER DESCRIPTIONS 11
    INTRODUCTION 11
    MOBIL SWEEPERS 11
    FMC SWEEPERS 13
    TYMCO SWEEPER 13
    A.P.T. IMPROVED STREET SWEEPER 16

CONTENTS

Page No.

SECTION 4 -- TEST METHODS 22
  STREET SOLIDS REMOVAL 22
    A.P.T. Sampler 25
    Bellevue Sampler 25
    Correlation of the Samplers 28
  DUST DISPERSION 30
  ISS SCRUBBER EMISSION 32

SECTION 5 -- RESULTS 33
  TEST AREAS AND SWEEPERS 33
    Bellevue Tests 33
    San Diego Tests 34
  DESCRIPTION OF STREET SOLIDS 35
    Distribution on the Street 35
    Size Distributions 40
  STREET SWEEPER CLEANING PERFORMANCE 40
    Parameters 40
    Total Street Solids 43
      Half of Street Residuals 43
      Sweeping Lane Residuals 43
      Amounts Removed 52
    Solids Larger Than 2000 Microns 61
    Solids From 500 to 2000 Microns 61
    Solids From 63 to 500 Microns 61
    Solids Smaller Than 63 Microns 74
    Solids Smaller Than 10 Microns-Aerodynamic 74
  RELATIVE DUST DISPERSION EFFECTS OF ISS MODIFICATIONS 83
  ISS SCRUBBER EMISSIONS 83
    ISS Scrubber Optimization Tests 83
    Emission Characteristics 88

CONTENTS

Page No.

SECTION 6 -- CONCLUSIONS 92

SECTION 7 -- RECOMMENDATIONS 93

SECTION 8 -- QUALITY ASSURANCE 94
- OBJECTIVES 94
- RESULTS 94
  - Cascade Impactor Calibration 95
  - Sampling Train Calibration 95
  - Vacuum Cleaner System 96
  - Sample Processing 97
    - Vacuum Cleaner Samples 97
    - Cascade Impactor Samples 98
  - Internal Quality Control Checks 98
  - Performance Audits 98
  - Results 100

References 102
Appendix A -- Data Analyses 104
Appendix B -- Bellevue Half-of-Street Data 115
Appendix C -- Bellevue Sweeping Lane Data 145
Appendix D -- San Diego Half-of-Street Data 164
Appendix E -- San Diego Sweeping Lane Data 193
Appendix F -- A.P.T. Sampler Data 222

LIST OF FIGURES

Number Page

1. Side view of a 4-wheeled broom sweeper 12
2. Side view of Tymco vacuum (Regenerative Air) sweeper . . 14
3. Schematic diagram of Tymco Model 600 regenerative air system 15
4. ISS gutter broom hood 17
5. Process diagram of ISS 19
6. Venturi section of the ISS scrubber 20
7. ISS and sampling trailer 21
8. Diagram of strips for sampling street solids 23
9. APT street dust sampling system 26
10. APT uniform airflow vacuum pickup head 26
11. Bellevue sampler 27
12. Pickup head of Bellevue sampler 29
13. Correlation of sampling methods 31
14. Comparison of initial samples at SE 30th St. 36
15. Comparison of initial samples at Surrey Downs 37
16. Comparison of initial samples at Mission Blvd. 38
17. Comparison of initial samples at Morena Blvd. 39
18. Size distribution of street solids from 1 to 11 μmA . . 41
19. Size distribution of street solids from 37 to 6300 μm . 42
20. Total solids performance at SE 30th St. from half of street samples 44
21. Total solids performance at Surrey Downs from half of street samples 45
22. Total solids performance at Mission Blvd. from half of street samples 46
23. Total solids performance at Morena Blvd. from half of street samples 47
24. Total solids performance at SE 30th St. from sweeping lane samples 48
25. Total solids performance at Surrey Downs from sweeping lane samples 49

LIST OF FIGURES, con't.

Number Page

26. Total solids performance at Mission Blvd. from sweeping lane samples 50
27. Total solids performance at At Morena Blvd. from sweeping lane samples 51
28. 90% Confidence Regions of total solids performances at SE 30th St., from sweeping lane samples 53
29. 90% Confidence Regions of total solids performances at Surrey Downs, from sweeping lane samples 54
30. 90% Confidence Regions of total solids performances at Mission Blvd., from sweeping lane samples 55
31. 90% Confidence Regions of total solids performances at Morena Blvd., from sweeping lane samples 56
32. Comparison of total solids removed at SE 30th St 57
33. Comparison of total solids removed at Surrey Downs . . . 58
34. Comparison of total solids removed at Mission Blvd . . . 59
35. Comparison of total solids removed at Morena Blvd . . . 60
36. Larger than 200µm performance at SE 30th St. from sweeping lane samples 62
37. Larger than 200µm performance at Surrey Downs from sweeping lane samples 63
38. Larger than 200µm performance at Mission Blvd. from sweeping lane samples 64
39. Larger than 200µm performance at Morena Blvd. from sweeping lane samples 65
40. 500 to 2000µm performance at SE 30th Street from sweeping lane samples 66
41. 500 to 2000µm performance at Surrey Downs from sweeping lane samples 67
42. 500 to 2000µm performance at Mission Blvd. from sweeping lane samples 68

LIST OF FIGURES, con't.

Number Page

43. 500 to 2000µm performance at Morena Blvd. from sweeping lane samples 69
44. 63 to 500µm performance at SE 30th St. from sweeping lane samples 70
45. 63 to 500µm performance at Surrey Downs from sweeping lane samples 71
46. 63 to 500µm performance at Mission Blvd. from sweeping lane samples 72
47. 63 to 500µm performance at Morena Blvd. from sweeping lane samples 73
48. Smaller than 63µm performance at SE 30th St. from sweeping lane samples 75
49. Smaller than 63µm performance at Surrey Downs from sweeping lane samples 76
50. Smaller than 63µm performance at Mission Blvd. from sweeping lane samples 77
51. Smaller than 63µm performance at Morena Blvd. from sweeping lane samples 78
52. Smaller than 10µmA performance at SE 30th St. from sweeping lane samples 79
53. Smaller than 10µmA performance at Surrey Downs from sweeping lane samples 80
54. Smaller than 10µmA performance at Mission Blvd. from sweeping lane samples 81
55. Smaller than 10µmA performance at Morena Blvd. from sweeping lane samples 82
56. Relative dust dispersions of Tymco and ISS at SE 30th St 84
57. Relative dust dispersions of Tymco and ISS at Surrey Downs 85
58. Relative dust dispersions of Tymco and ISS at Mission Blvd 86
59. Relative dust dispersions of Tymco and ISS at Morena Blvd 87
60. Penetration curves of ISS Venturi Scrubber 89
61. A typical size distribution of the ISS scrubber emissions 90

LIST OF FIGURES, con't.

Number Page

62. ISS scrubber emissions and initial and residual street solids 91
63. Comparison of present study data to City of Bellevue data, for Mobil sweeper, from half-of-street samples 101
64. Cascade impactor calculation sheet 1 106
65. Cascade impactor calculation sheet 2 107
66. Cascade impactor calculation sheet 3 108
67. Cascade impactor calculation sheet 4 109
68. Cascade impactor calculation sheet 5 110

LIST OF TABLES

Number Page

1. Internal QC check for particle sampling 99

NOMENCLATURE

d_p = physical particle diameter, µm
d_{pa} = aerodynamic particle diameter, µmA
K_p = inertial impaction parameter, dimensionless
Q_G = gas flow rate, m^3/s
Q_L = liquid flow rate, l/s
µm = micron = 10^{-6}m
µmA = micron-aerodynamic, $\mu m(g/cm^3)^{1/2}$

ACKNOWLEDGMENT

A.P.T., Inc. expresses grateful appreciation to the following individuals for their contribution during this study:

William Kuykendal*	Project Officer, EPA, AEERL
Richard Field	Project Officer of runoff study, EPA, SCSSS/Edison, NJ
Pam Bissonnette	Storm and Surface Water Utility Manager, City of Bellevue, WA
Robert Pitt	Consulting Environmental Engineer of City of Bellevue runoff study

Sincere gratitude goes to the Cities of Bellevue, WA and San Diego, CA for providing street sweepers and operators during this project.

---

* No longer with AEERL.

SECTION 1

SUMMARY

INTRODUCTION

Many metropolitan areas in the U. S. are out of compliance with the National Ambient Air Quality Standards (NAAQS) for particulate matter. A major source of this urban particulate matter is the dust emissions from paved streets. The contribution of re-entrained street dust to ambient concentrations amounts to about one-third of the NAAQS secondary standard.

One way to reduce particle emissions from streets is to reduce the amount of street dust. The most common method for doing this is street sweeping. However, most street sweepers are not designed with fine particle removal as a priority. They have been primarily designed to remove trash and larger solids, which make the streets look clean. In addition, most street sweepers disperse some of the street dust into the air during sweeping.

To address the large potential for reducing airborne particles by better street cleaning, A.P.T. developed an Improved Street Sweeper (ISS) under a previous U.S. EPA contract (No. 68-02-3148). Under that contract, A.P.T. performed experiments to develop modifications for improving the ability of municipal street sweepers to remove dust particles from urban streets and for containing the particle dispersions of sweepers. A Tymco Model 600 regenerative air street sweeper was modified. The modifications included a partial hood to capture the particles dispersed by the gutter broom and a scrubber to collect the particles from the vent air stream.

The ISS was subjected to a limited testing program in San Diego and Los Angeles during the previous contract. Results clearly indicated that the ISS could eliminate the dust plume during sweeping and give a cleaner street. However, additional research work was needed to refine the design and to demonstrate its capability.

Under this contract, extensive tests were conducted to determine the improved street cleaning performance and the effectiveness for reducing fugitive particle emissions from the ISS.

OBJECTIVES

The ISS was evaluated along with other conventional sweepers in Bellevue, Washington, and in San Diego, California. Objectives for this study were as follows:

1. Compare the street cleaning abilities of the following street sweepers:
    a. A.P.T. ISS
    b. Tymco Model 600 regenerative air sweeper
    c. Mobil broom sweeper
    d. FMC broom sweeper.
2. Compare the dust dispersions of the ISS and Tymco sweepers.
3. Determine particle emissions from the improved street sweeper.
4. Evaluate the effects of street cleaning on water runoff. This portion of the work was done in the City of Bellevue, Washington, in conjunction with EPA's Municipal Environmental Research Laboratory, Edison, New Jersey. The results of this work are reported in a separate report (Pitt, 1984).

STREET SWEEPER DESCRIPTIONS

Street sweepers can be categorized into two major groups according to the mechanism that they use to pick up solids from the street. These two groups are broom sweepers and vacuum sweepers. The ISS is a vacuum sweeper with equipment added by

A.P.T. for performance improvement. Brief descriptions of the four sweepers evaluated in this study are presented below.

Mobil and FMC Sweepers

Both the Mobil and the FMC sweepers were 4-wheeled broom sweepers with similar features. They use rotating gutter brooms to move the dirt from the area near the curb to the area under the sweeper. From there, the dirt is swept onto a squeegee-type dirt elevator by a large, cylindrical, pickup broom that rotates about a horizontal shaft at the rear of the sweeper. The dirt elevator lifts the dirt into a collection hopper.

Tymco Sweeper

The Tymco model 600 sweeper is a vacuum sweeper which uses a regenerative air system that recirculates the air for vacuuming up the street dirt. A gutter broom moves the street dirt from the curb toward the center of the sweeper. A blower forces air through a slot in the pickup head which rides on and seals against the street surface. The slot directs a high-velocity blast at the street surface, loosening the dirt. The dirt is then vacuumed up and is carried to a hopper through a vacuum hose. In the hopper, paper and leaves are removed from the air stream by a screen, and large particles are removed by a centrifugal separator. The air then enters the blower to complete the cycle.

A.P.T. Improved Street Sweeper

The ISS is the above Tymco sweeper with modifications to maximize the collection of fine particles. The modifications included the following:

1. Installation of partial hood around each gutter broom and vent the hood to the hopper.

2. Increase of the vacuum in the pickup head by venting about 1,000 cfm of air out of the regenerative air system.
3. Installation of a low pressure drop Venturi scrubber to clean the vent air.

TEST METHODS

Four sweeper performance parameters were measured in this study: the ability of a street sweeper to remove solids from a street surface, the relative dust dispersions of the ISS and the Tymco sweepers, and the mass rate and size-distribution of the ISS scrubber emissions. The measurement methods are summarized below.

Street Solids Removal

The ability of a street sweeper to remove solids from a street was determined by measuring the amount of street solids on the street before and after sweeping. The street solids of 5 to 60 randomly selected strips were collected by vacuuming. The collected solids were then sized with sieves. The particles smaller than 15 µmA were sized with cascade impactors during the vacuuming. The sweeper performance was determined from the plotting of residual solids versus initial solids.

Two types of samples were taken: half-of-street strips from the curb to the street centerline, and strips of the sweeping lane. The half-of-street samples were taken to express sweeper performance in the measurement term commonly used in street sweeping studies. Performance based on half-of-street samples may be penalized because part of the sampled area is not swept. The sweeping lane samples were taken to accurately determine the ability of a sweeper to remove the solids from its path.

Dust Dispersion

The mass of the dust dispersed by the Tymco and the ISS were determined with two glass-fiber filters mounted on the top of the pickup head at its leading edge.

ISS Scrubber Emission

The mass emission rate and the size distribution of the particles emitted by the ISS scrubber were determined by sampling the outlet of the scrubber with a cascade impactor.

RESULTS

Test Areas and Sweepers

In Bellevue, sweepers were tested at two areas: SE 30th St. (in a light-industrial area) and Surrey Downs (a residential neighborhood). The ISS, the Tymco, and Mobil sweepers were tested at both areas.

In San Diego tests were made at two areas: Mission Blvd. (in a commercial-residential-recreational area) and Morena Blvd. (in a commercial area). At Mission Blvd., the ISS, the Tymco, Mobil, and FMC sweepers were tested. At Morena Blvd., the ISS, the Tymco, and FMC sweepers were tested.

Distribution of Street Solids

Comparison of the initial half-of-street and sweeping lane samples revealed that 70 to 100% of the street solids were within the sweeping lane. The mass median diameters of the street solids were found to vary from 200 to 500 microns.

Street Sweeper Cleaning Performance

The street cleaning performance of a street sweeper cannot be expressed in terms of removal efficiency because the efficiency depends on the amount of solids on the street, the size distribution of the solids, and the street surface characteristics. Instead, the sweeper performance was evaluated based on plots of residual versus initial solids on the street. The effect of particle size on sweeper performance was determined from plots for different particle size ranges. To eliminate the effects of street surface characteristics on sweeper performance, each graph is for only one test site.

The results of the evaluation are as follows:

1. Mechanical sweepers were ineffective in removing smaller particles, especially those smaller than 125 microns. In some cases, there were more small particles on the street after sweeping than before sweeping.
2. The Tymco vacuum sweeper removed more fine particles than the mechanical sweepers but not as much as the ISS.
3. The ISS had the best street cleaning performance, leaving a constant level of residual solids in the swept lane, which was independent of the level of initial solids.

Relative Dust Dispersed by Tymco and ISS

The mass concentrations of dust measured at the pickup head of the ISS and the Tymco varied widely. Therefore, it cannot be concluded that the ISS dispersed less dust during sweeping. However, based on visual observations, the ISS did have a smaller dust plume.

ISS Scrubber Emissions

The mass median diameter of the particles in the ISS scrubber exhaust was about 2 μmA, and 94% of the emissions were smaller than 10 µmA. The mass emission was between 2 to 40% of the initial solids smaller than 10 µmA on the street.

CONCLUSIONS

The results of this study show that the Improved Street Sweeper (ISS) removes more street solids than the same sweeper without the improvements for all particle-size fractions. It also removes much more of the street solids than the widely used broom sweepers. Typically, a broom sweeper removes 20% of the street solids, the Tymco sweeper removes 70%, and the ISS removes 80%. Additionally, the ISS was the only sweeper tested that gave a constant, low level of residual street solids that was independent of the initial amount of solids on the street. However, the residual level does depend on the street surface characteristics.

Based on visual observations, the ISS dispersed less dust during sweeping. However, the data from measurements of the dust concentration at the pickup head of the Tymco and the ISS were too scattered to allow statistical verification.

The mass median diameter of particles in the ISS scrubber exhaust was 2 µm aerodynamic, and 94% of the emissions were smaller than 10 µmA. The mass emission was between 2 to 40% of the initial solids on the street which were smaller than 10 µmA diameter.

RECOMMENDATIONS

This evaluation shows that the Improved Street Sweeper (ISS) cleans streets much better than conventional sweepers. However, its effects on ambient air quality have not been measured. To complete the evaluation of the ISS, the emission factors of the ISS and conventional sweepers need to be measured. This could be accomplished by sampling ambient air upwind and downwind of streets during and between sweepings.

SECTION 2

INTRODUCTION

PARTICLE EMISSIONS FROM STREETS

Many metropolitan areas in the U.S. are out of compliance with the National Ambient Air Quality Standards (NAAQS) for particulate matter. A major source of this urban particulate matter is the dust emissions from paved streets (Draftz, 1979). In many downtown areas, the wind and vehicle-induced re-entrainment of street dust is a large source of particulate matter. The contribution of re-entrained street dust to ambient concentrations of total suspended solids is about 14 to 20 micrograms per cubic meter (Bradway and Record, 1976), which amounts to about one-third of the NAAQS secondary standard of 60 micrograms per cubic meter (annual geometric mean).

The amount of particles emitted from a paved street depends on the dirtiness of the street, wind velocity, traffic speed, and traffic volume. The U. S. EPA's average emission factor for dust emission from paved roads is 3.5 g/vehicle-km (5.6 g/vehicle-mile)(EPA, 1977). Ninety-one percent of the entrained dust is street dust, and the remaining 9% is tire wear and exhaust.

One way to reduce particle emissions from streets is to reduce the amount of street dust. The most common method for doing this is street sweeping. However, most street sweepers are not designed with fine particle removal as a priority. They have been primarily designed to remove the trash and larger solids, which make the streets look clean. In addition, most street sweepers disperse some of the street dust into the air during sweeping.

The potential for reducing the particle emissions from streets by cleaning is great. For example, Roberts (1973) found that cleaning a dirty paved road could reduce particle emissions from the road by more than 80%.

DEVELOPMENT OF AN IMPROVED STREET SWEEPER

To address this large potential for reducing airborne particles, Air Pollution Technology, Inc. developed an improved street sweeper (ISS) under a previous U.S. EPA contract (No. 68-02-3148). Under this contract, A.P.T. performed an experimental program to develop modifications for improving the ability of municipal street sweepers to remove inhalable dust particles from urban streets, and for containing the particle dispersions of these sweepers. During this experimental program, a Tymco Model 600 regenerative air vacuum street sweeper was modified. The modifications included a partial hood to capture particles dispersed by the gutter broom and a scrubber for collection of fine particles from the vent air.

The ISS was subjected to a limited testing program in San Diego and Los Angeles during the previous contract. Results clearly indicated that the ISS can eliminate the dust plume during sweeping and give a cleaner street. However, additional research work was needed to refine the design and to demonstrate its capability.

PROJECT OBJECTIVES

Under this contract, extensive tests were conducted to determine the improved street cleaning performance and the effectiveness for reducing fugitive particle emissions from the ISS. The ISS was evaluated along with other conventional sweepers in Bellevue, Washington and in San Diego, California. The tests done in Bellevue were performed cooperatively with the City of Bellevue, which studied the effect of street sweeping on urban runoff quality (under contract with the Municipal Environmental Research Laboratory of the U.S. EPA).

The objectives for this study were as follow:

1. Compare the street cleaning abilities of the following street sweepers:
    a. A.P.T. ISS
    b. Tymco Model 600 regenerative air sweeper
    c. Mobil broom sweeper
    d. FMC broom sweeper
2. Compare the dust dispersions of the ISS and the Tymco sweepers.
3. Determine particle emissions from the improved street sweeper.

This report documents the methodologies and results of this evaluation study.

SECTION 3

STREET SWEEPER DESCRIPTIONS

INTRODUCTION

Street sweepers can be categorized into two major groups according to the mechanism that they use to pick up solids from the street. These two groups are broom sweepers and vacuum sweepers. A third, smaller subgroup is vacuum-assisted broom sweeper. Another type of street cleaner are flushers, but they flush with water rather than sweep. The Improved Street Sweeper (ISS) is a vacuum sweeper with equipment added by A.P.T. for performance improvement.

The performance of the ISS was compared with that of conventional broom sweepers and a vacuum sweeper in Bellevue, WA and in San Diego, CA. The Bellevue broom sweepers were manufactured by Mobil. In San Diego, Mobil and FMC broom sweepers were tested. The vacuum sweeper was a Tymco Regenerative Air Sweeper and was used in both cities. Descriptions of the four sweepers used in this study are given below.

MOBIL SWEEPERS

The Mobil sweepers were four-wheeled broom sweepers, as shown in Figure 1. They use a rotating gutter broom to move the dirt from the area of the street near the curb to the portion of the street under the sweeper. A center, rubber strip stops the dirt from over-shooting the center of the sweeper. From there, the dirt is swept onto a squeegee-type dirt elevator by a large, cylindrical, pickup broom that rotates about a horizontal shaft at the rear of the sweeper. The dirt elevator lifts the dirt

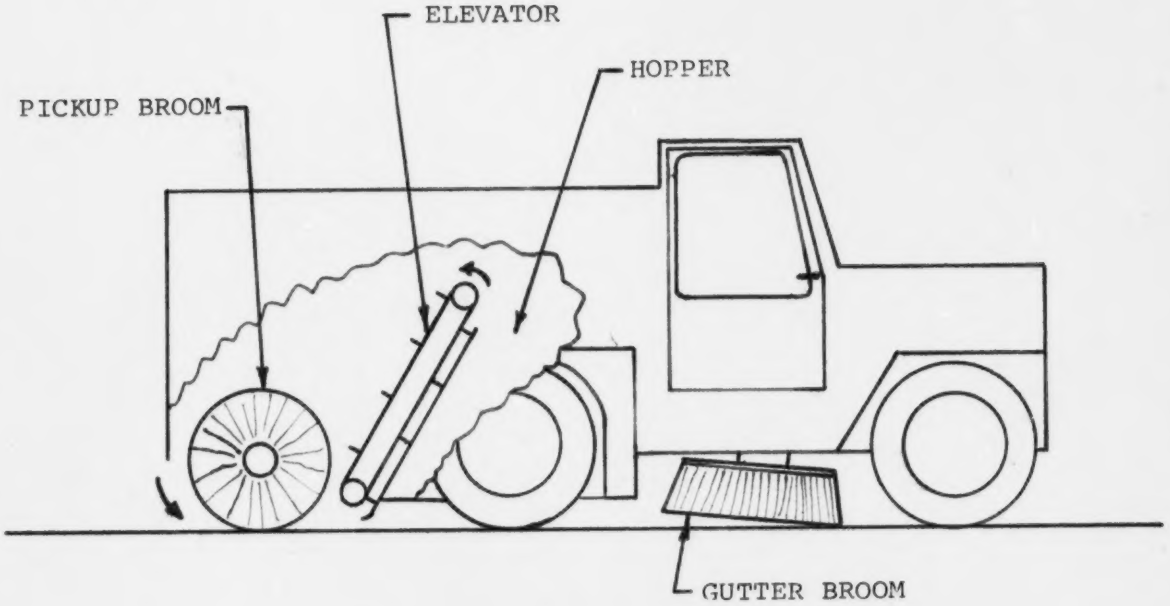

ELEVATOR
HOPPER
PICKUP BROOM
GUTTER BROOM

Figure 1. Side view of a 4-wheeled broom sweeper.

into a collection hopper. Across the front of the sweeper, and at the gutter broom, water sprays are used to suppress dust dispersions during sweeping.

In Bellevue, the two Mobil sweepers used were a 1971 model TE3 and a 1973 model DF3. In San Diego, the several Mobil sweepers were 1976 TE3 and 1978 TE4 models.

FMC SWEEPERS

In the San Diego tests, several 1982 FMC model 12's were tested. The design of these four-wheeled broom sweepers are similar to the Mobil sweepers described above. The major difference is in the gutter broom arrangement. The FMCs have two brooms of smaller diameter at the gutter, rather than one as on the Mobil sweepers. One broom moves the dirt from the gutter, and the second broom, located inside and behind the first broom, moves the dirt the rest of the distance to the area in front of the pickup broom.

TYMCO SWEEPER

The 1980 Tymco model 600 regenerative air, vacuum sweeper upgraded under the previous contract with the U.S. EPA, was used in the unmodified mode for baseline tests. This sweeper, illustrated in Figure 2, uses a regenerative air system for dust pickup. Figure 3 shows a schematic diagram of the dust pickup mechanism of the sweeper. The gutter broom moves the street debris from the curb toward the center of the sweeper where there is a rubber, backstop strip. The blower forces air through the pressure hose and the blast orifice slot of the pick up head, creating a full width, high velocity blast that loosens debris from the street. The pickup head has rubber curtains at its leading and trailing edges to seal against the street. The head rides on its metal side edges. The fan establishes vacuum in the hopper which sucks up the debris through the vacuum hose into the hopper, where the air loses velocity, and heavy or large debris

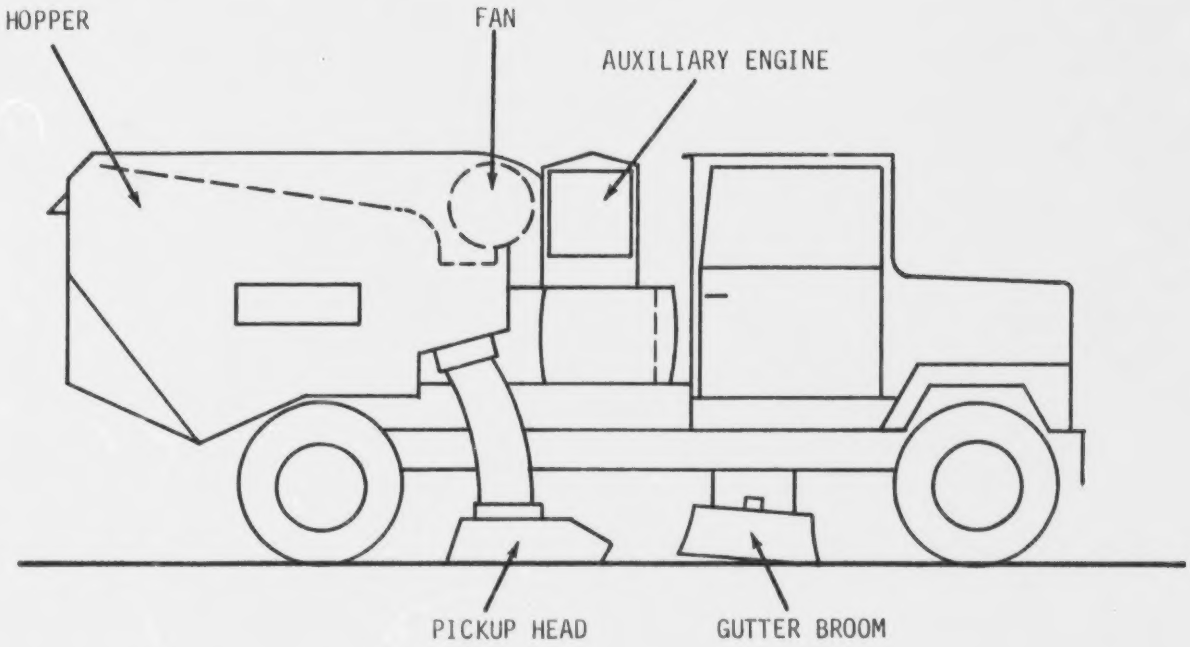

HOPPER
FAN
AUXILIARY ENGINE
PICKUP HEAD
GUTTER BROOM

Figure 2. Side View of TYMCO Vacuum (Regenerative Air) Sweeper

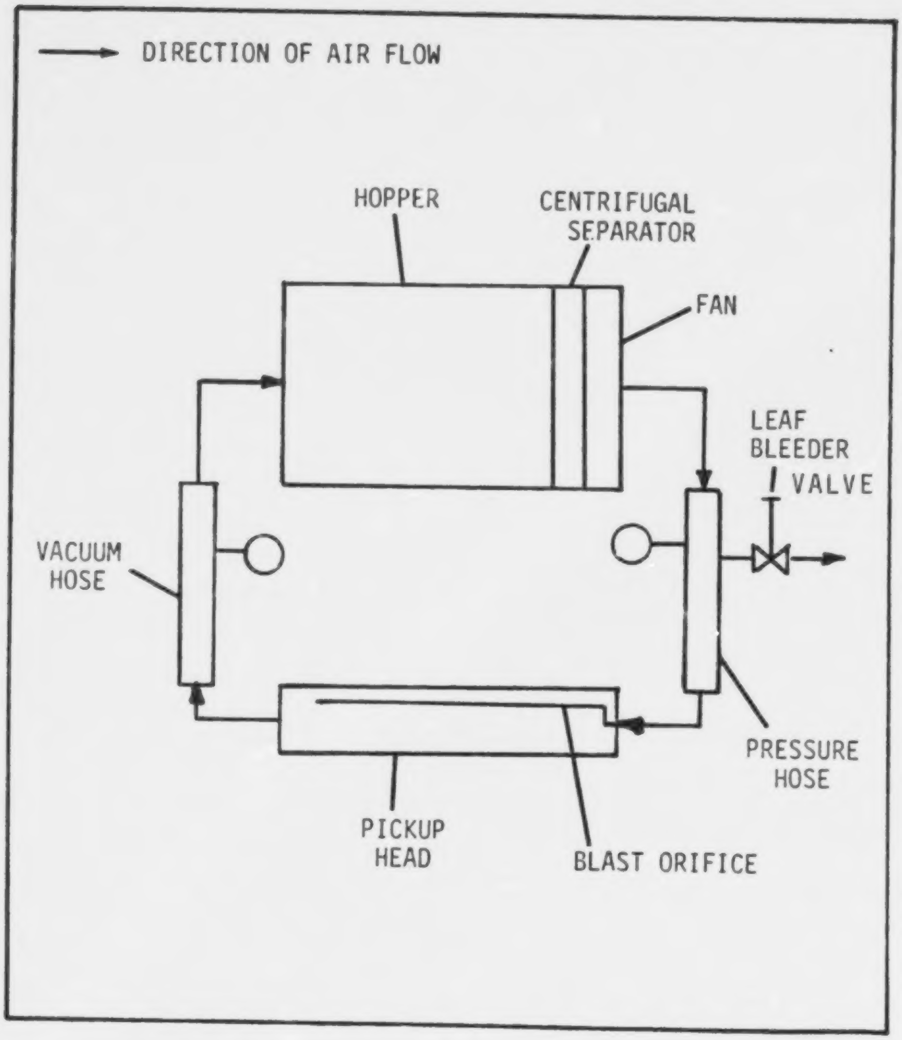

DIRECTION OF AIR FLOW
HOPPER
CENTRIFUGAL SEPARATOR
FAN
LEAF BLEEDER VALVE
VACUUM HOSE
PRESSURE HOSE
PICKUP HEAD
BLAST ORIFICE

Figure 3. Schematic diagram of TYMCO Model 600 regenerative air system

falls to the hopper floor. The air is drawn through a screen to remove paper and leaves, and then enters a centrifugal separator where large dust particles are collected and thrown into the hopper. The air is then drawn into the blower to start another cycle.

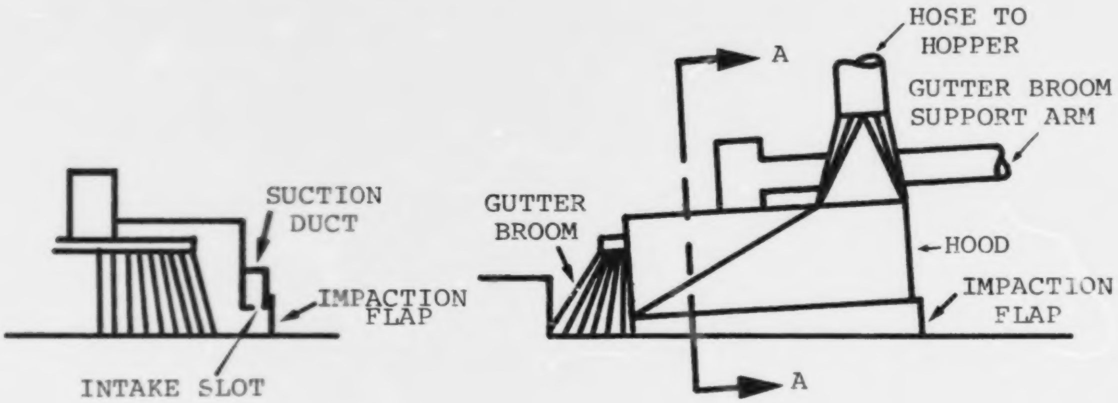
A positive pressure is maintained at the pickup head blast orifice slot, and a negative pressure in the pickup head vacuum inlet and in the hopper. The air flow rate and the static pressure in the system can be varied by changing the blower speed. High blower speeds are used to entrain heavy materials and low blower speeds are used for finer materials. Further, the vacuum in the pickup head can be increased by bleeding air out through the leaf bleeder valve, which is opened when picking up leaves.

To suppress dust clouds, the Tymco has 3 water spray nozzles at each end of the pickup head, 3 at each gutter broom, and 4 inside the hopper.

A.P.T. IMPROVED STREET SWEEPER

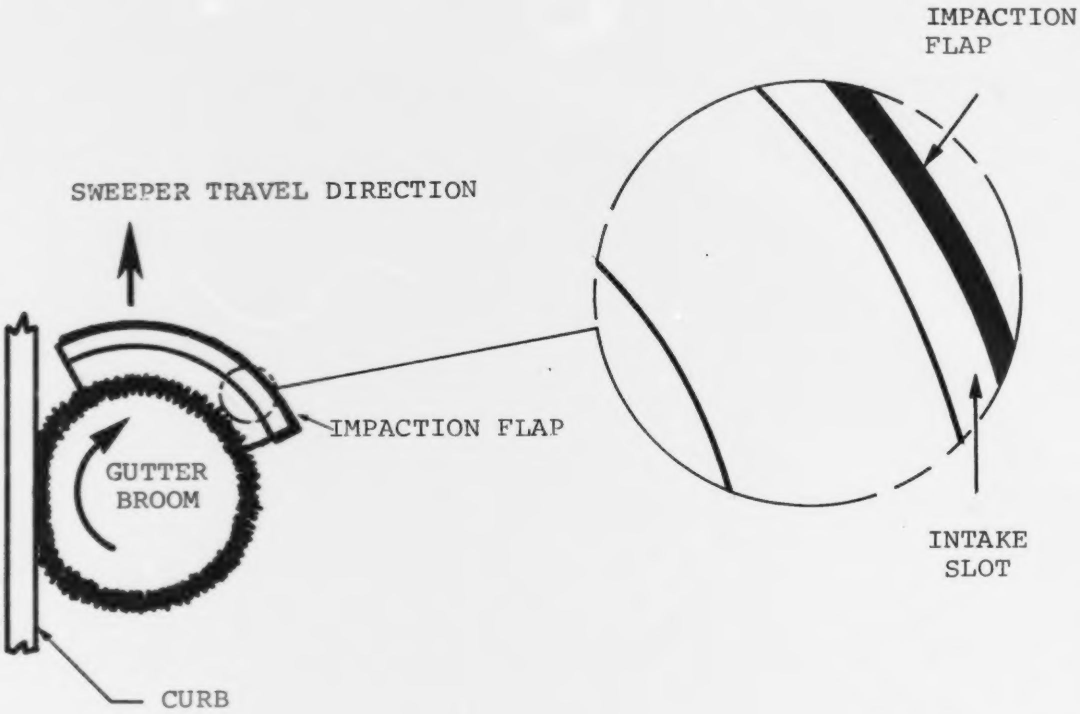
The ISS is the Tymco sweeper described above with modifications performed by A.P.T. under EPA Contract No. 68-02-3148. The primary objective of the modifications were to maximize the collection of fine particles. Observations made during sweeping revealed that the gutter broom dust plume and dust leakage from the pickup head were the major sources of fugitive dust emissions from the Tymco sweeper.

The dust clouds around each gutter broom were controlled with a partial hood and ducting to the hopper. The gutter broom hood design is shown in Figure 4. It has a suction slot and a rubber, impaction flap around the outside of the hood. The dirt moved by the gutter broom impacts against the rubber flap. Plumes of fine particles form as they separate from the coarser particles and are sucked up by the hood. The intake slot of the hood and the manifold are shaped to produce a uniform, high velocity in the slot (approximately 30 m/s (100 ft/s)).


SUCTION DUCT
IMPACTION FLAP
INTAKE SLOT
A
HOSE TO HOPPER
GUTTER BROOM SUPPORT ARM
GUTTER BROOM
HOOD
IMPACTION FLAP
A

SECTION A-A

FRONT VIEW


IMPACTION FLAP
SWEEPER TRAVEL DIRECTION
IMPACTION FLAP
GUTTER BROOM
INTAKE SLOT
CURB

BOTTOM VIEW

Figure 4. ISS gutter broom hood.

The other major source of fugitive dust emissions is the pickup head. These emissions occur when uneven street surfaces are swept and the pickup head does not seal well against the street. These pick up head emissions were greatly reduced by venting air out of the regenerative air system through the leaf bleeder valve (shown in Figure 3) and a particle scrubber. This venting causes a net inflow into the pickup head through its perimeter at the street surface.

The dusty, vented air is cleaned with a wet scrubber before it is discharged into the ambient air. A spray scrubber was originally installed on the ISS in the previous contract. It was converted to a low pressure drop Venturi scrubber at the beginning of this study, because the relatively small spray scrubber had large losses of water drops on the walls of the scrubber.

The overall functional relationships of the ISS components are shown in Figure 5. Most of the air flow recirculates through the pickup head, hopper, and fan. In addition, air enters the system through the gutter broom hoods (0.17 m^3/s (350 cfm) at each hood) and the pickup head. It is balanced by the air (0.47 m^3/s (1000 cfm)) that exits through the scrubber via the leaf bleeder valve.

The scrubber sump and pump are mounted inside the hopper. The sump is a modified 208 liter (55 gal) barrel. Water is circulated with a pair of small, 12-volt (D.C.) centrifugal pumps connected in parallel. The dimensions of the Venturi section of the scrubber are shown in Figure 6.

A side view of the ISS is illustrated in Figure 7. The long lengths of duct upstream and downstream of the scrubber were included to allow representative sampling during testing for collection efficiency. Also, the scrubber is mounted on top of the sweeper to allow easy access during sampling; however on a mass-produced version of the ISS, the scrubber could be inside the hopper, and the long ducting would not be needed. The trailer in Figure 7 carries sampling equipment and is not needed for the operation of the ISS.

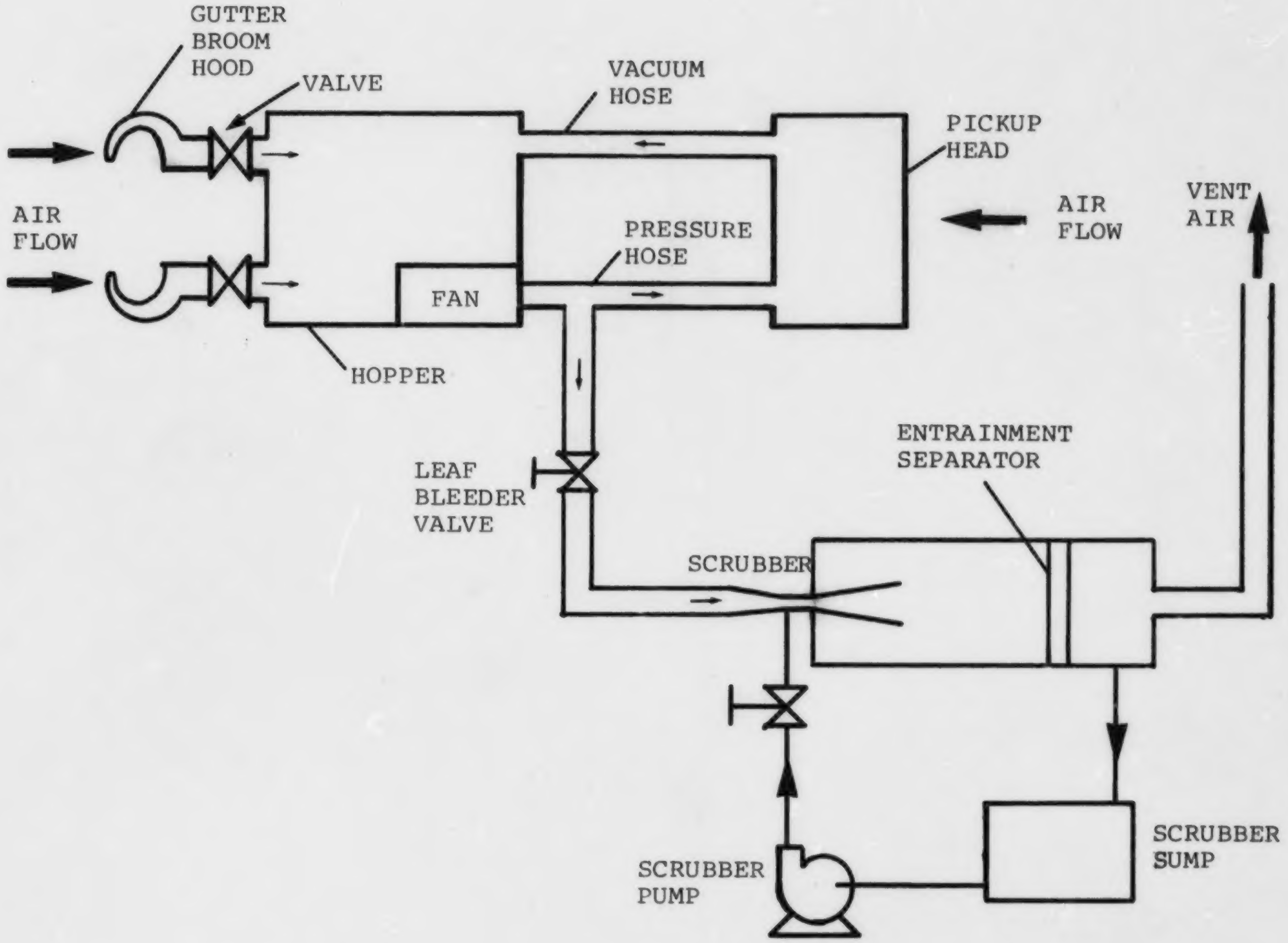
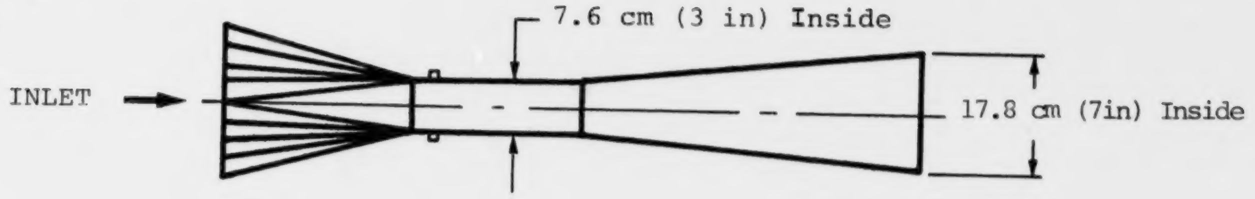
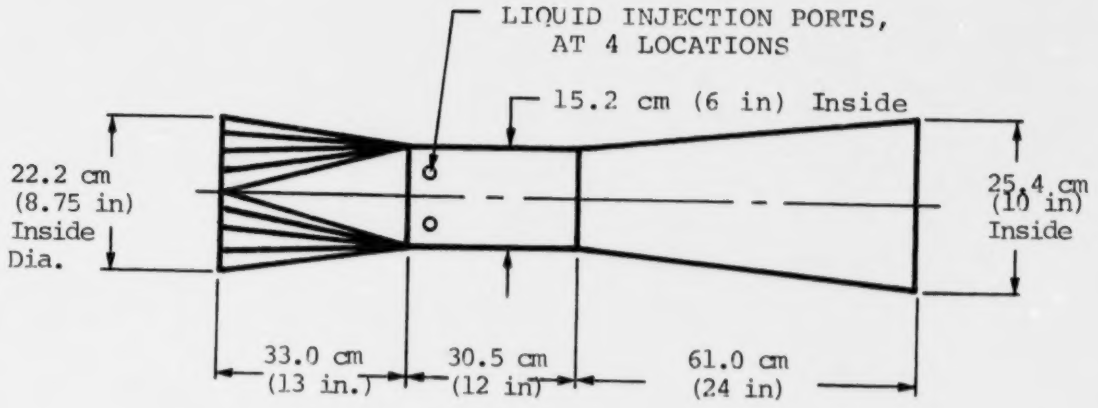

GUTTER
BROOM
HOOD
VALVE
VACUUM
HOSE
PICKUP
HEAD
AIR
FLOW
AIR
FLOW
VENT
AIR
PRESSURE
HOSE
FAN
HOPPER
LEAF
BLEEDER
VALVE
ENTRAINMENT
SEPARATOR
SCRUBBER
SCRUBBER
PUMP
SCRUBBER
SUMP

Figure 5. Process diagram of ISS.


7.6 cm (3 in) Inside
INLET
17.8 cm (7in) Inside

TOP VIEW


LIQUID INJECTION PORTS,
AT 4 LOCATIONS
15.2 cm (6 in) Inside
22.2 cm
(8.75 in)
Inside
Dia.
25.4 cm
(10 in)
Inside
33.0 cm
(13 in.)
30.5 cm
(12 in)
61.0 cm
(24 in)

SIDE VIEW

Figure 6. Venturi section of the ISS scrubber.

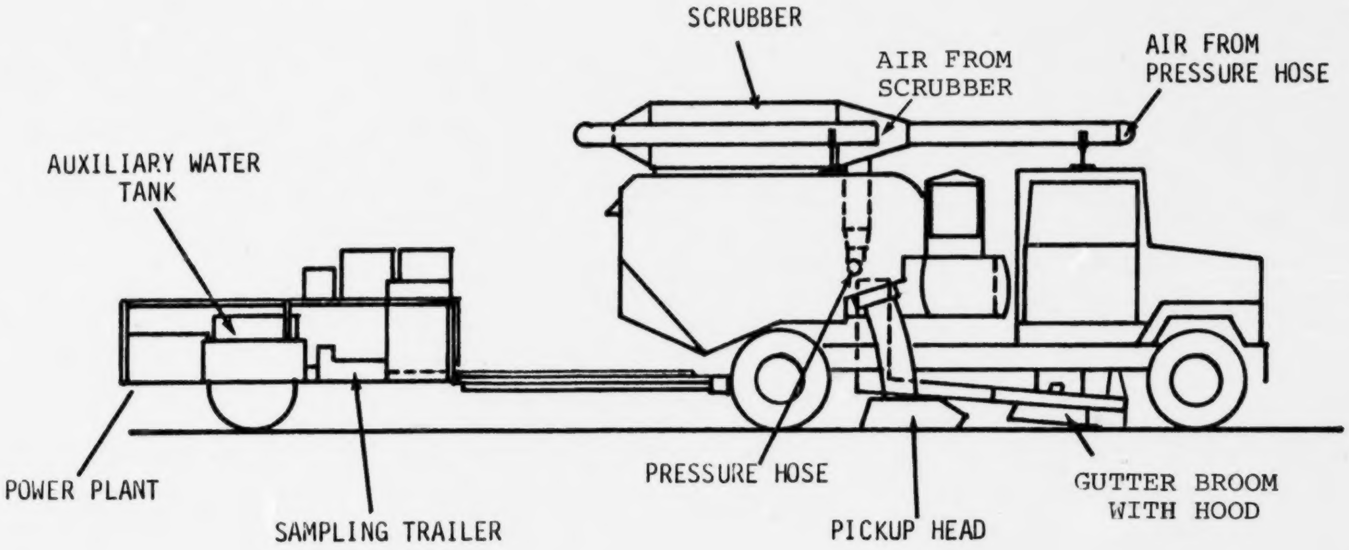

SCRUBBER
AIR FROM SCRUBBER
AIR FROM PRESSURE HOSE
AUXILIARY WATER TANK
POWER PLANT
SAMPLING TRAILER
PRESSURE HOSE
PICKUP HEAD
GUTTER BROOM WITH HOOD

Figure 7. ISS and sampling trailer.

SECTION 4

TEST METHODS

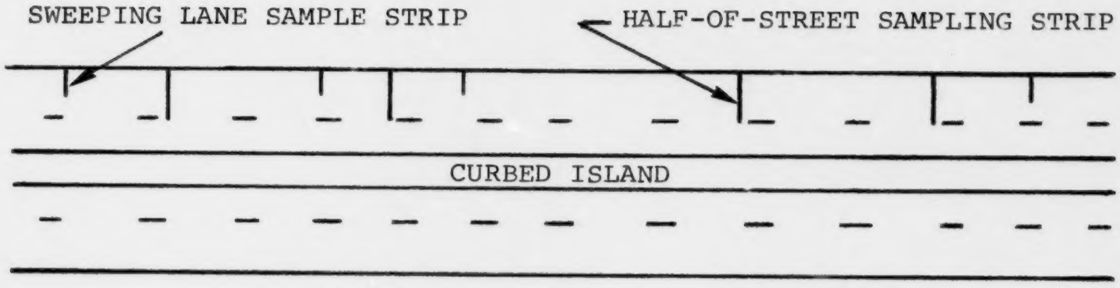
Four sweeper performance parameters were measured in this study: the ability of a street sweeper to remove solids from a street surface, the relative amount of dust dispersed by the ISS and the Tymco sweepers, and the mass rate and size-distribution of the ISS scrubber emissions. The measurement methods are described below. The quality assurance methods and results are presented in Section 8.

STREET SOLIDS REMOVAL

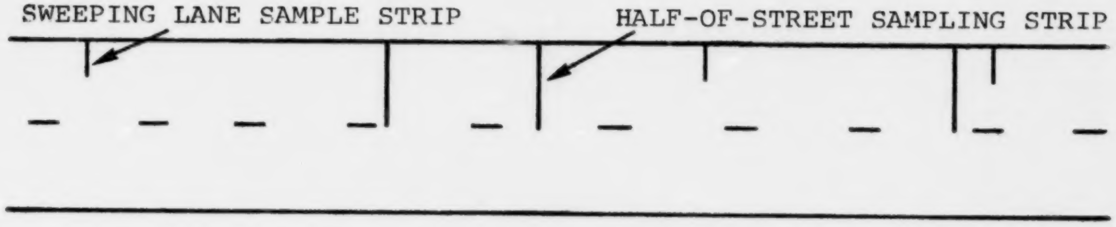
The ability of a street sweeper to remove solids from a street was measured by sampling street solids from test sections of street before and after sweeping. Each test was performed on a test section of street, that was from 160 to 320 m (0.1 to 0.2 mi.) long. The width of each test section was from the street centerline to the curb, on only one side of the street. Each test involved only one sweeper, making one sweeping pass next to the curb (this is the usual municipal street sweeping method).

Each street dust sample was taken by vacuuming 5 to 60 randomly selected strips (the number depending upon visual observation of the dirtiness of the street) and the width of each strip is the same width as the vacuum pickup head. For each test, care was taken not to locate strips where previous strips were sampled. Two types of samples were taken: half-of-street strips from the curb to the centerline, and strips in the sweeping lane. These strips are illustrated in Figure 8.

The common term for expressing the amount of solids on a street is weight per curb-length. This commonly includes the solids on the street that are between the curb and the centerline of the street, that is, the solids of half of the street are associated with each curb. Consequently, the half-of-street


SWEEPING LANE SAMPLE STRIP
HALF-OF-STREET SAMPLING STRIP
CURBED ISLAND

MISSION BLVD.


SWEEPING LANE SAMPLE STRIP
HALF-OF-STREET SAMPLING STRIP

SE 30th ST., SURREY DOWNS, AND MORENA BLVD.

Figure 8. Diagram of strips for sampling street solids.

samples were used to express sweeper performance relative to this commonly accepted measure of street solids. In other words, the half-of-street samples indicate how much of all of the solids on the street are removed.

The sweeping lane samples were taken to determine how well a sweeper removes the solids from its path. The sweeping lane samples taken after sweeping indicate how much solids the sweeper was unable to pickup. Whereas, the half-of-street samples taken after sweeping only indicate the sum of the left-behind solids and the solids outside the path of the sweeper. Thus, the sweeping lane samples provide a closer, more accurate measure of sweeper performance than the half-of-street samples.

In any case where a sweeper moves some solids from the swept lane to the unswept portion of the street, comparison of the half-of-street and sweeping lane samples will reveal this. Also, comparison of the two types of samples will indicate how much of the solids are outside the sweeping lane. This could aid decisions concerning how much of the street width to sweep.

Two types of street dust samplers were used for measuring the street solids concentration: one used by the City of Bellevue and one developed by A.P.T. Both samplers use vacuum cleaners to vacuum up the street solids. The major difference between these two samplers is in the design of the vacuum pickup head. The A.P.T. sampler was designed to only pick up the dust which can be re-entrained by air movement. It has a fixed gap between the pickup head and the street to create a uniform air flow field at the street surface, simulating typical air currents that re-entrain street dust. The Bellevue sampler was designed to pick up all dust that can be washed off by a rain storm.

The Bellevue sampler picks up more dust than the A.P.T. sampler because dust deposited in cracks and crevices can be vacuumed up by the Bellevue sampler and not by the A.P.T. sampler. Both samplers were used for the first 7 tests in Bellevue to obtain a correlation between the two methods. Only the Bellevue sampler was used for the rest of the tests (including the tests done in San Diego), because it required less time for sampling, and EPA's relationship between street dust emission factor and street dust concentration was based on measurements with the Bellevue type of sampler. The samplers are described below.

A.P.T. Sampler

Figure 9 shows a schematic diagram of the A.P.T. street dust sampler. It consists of a pickup head, a vacuum wand, an industrial vacuum cleaner, and a cascade impactor sampling system. The A.P.T. pickup head is shown in Figure 10. It is designed to sample only those street solids which would normally be re-entrained by air currents caused by moving vehicles and wind. The pick up head is circular with a diameter of 6.0 cm (2.4 in.). The clearance between the head and the street is such that there is an inward flow with a velocity of 97 km/hr (60 mph) at the street surface. The dust dislodged by the air flow is drawn into the vacuum cleaner and filtered by a high efficiency woven fabric bag. The dust collected in the bag is later sized by sieve analysis.

The particles smaller than 15 µmA are sized with a cascade impactor sampling train. A sample probe in the inlet pipe of the vacuum cleaner withdraws an isokinetic sample of the air stream. The sample passes through a pre-cutter to remove the particles with aerodynamic diameters larger than approximately 15 to 20 microns-aerodynamic (µmA) and then through a University of Washington Mark III cascade impactor for size fractionation.

Bellevue Sampler

The Bellevue sampler is that designed by Pitt (1979) and is illustrated in Figure 11. The system consists of a pick up nozzle, two vacuum cleaners in parallel, and a cascade impactor sampling system. Pitt's original design did not include the cascade impactor. It was added in this study for sizing particles smaller than 15 µmA. The pickup nozzle is shown in

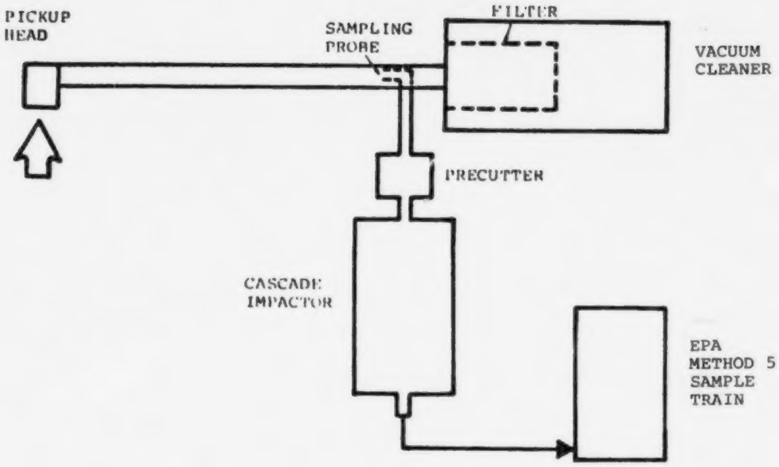

PICKUP
HEAD
SAMPLING
PROBE
FILTER
VACUUM
CLEANER
PRECUTTER
CASCADE
IMPACTOR
EPA
METHOD 5
SAMPLE
TRAIN

Figure 9. A.P.T. street dust sampling system.

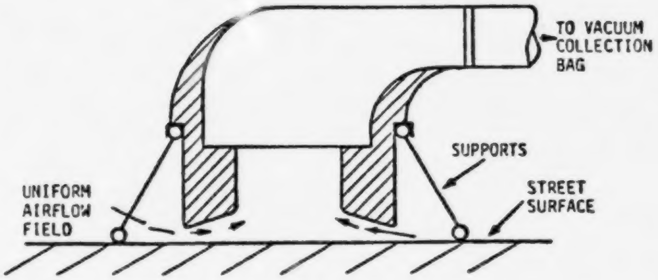

TO VACUUM
COLLECTION
BAG
SUPPORTS
UNIFORM
AIRFLOW
FIELD
STREET
SURFACE

Figure 10. A.P.T. uniform airflow vacuum pickup head.

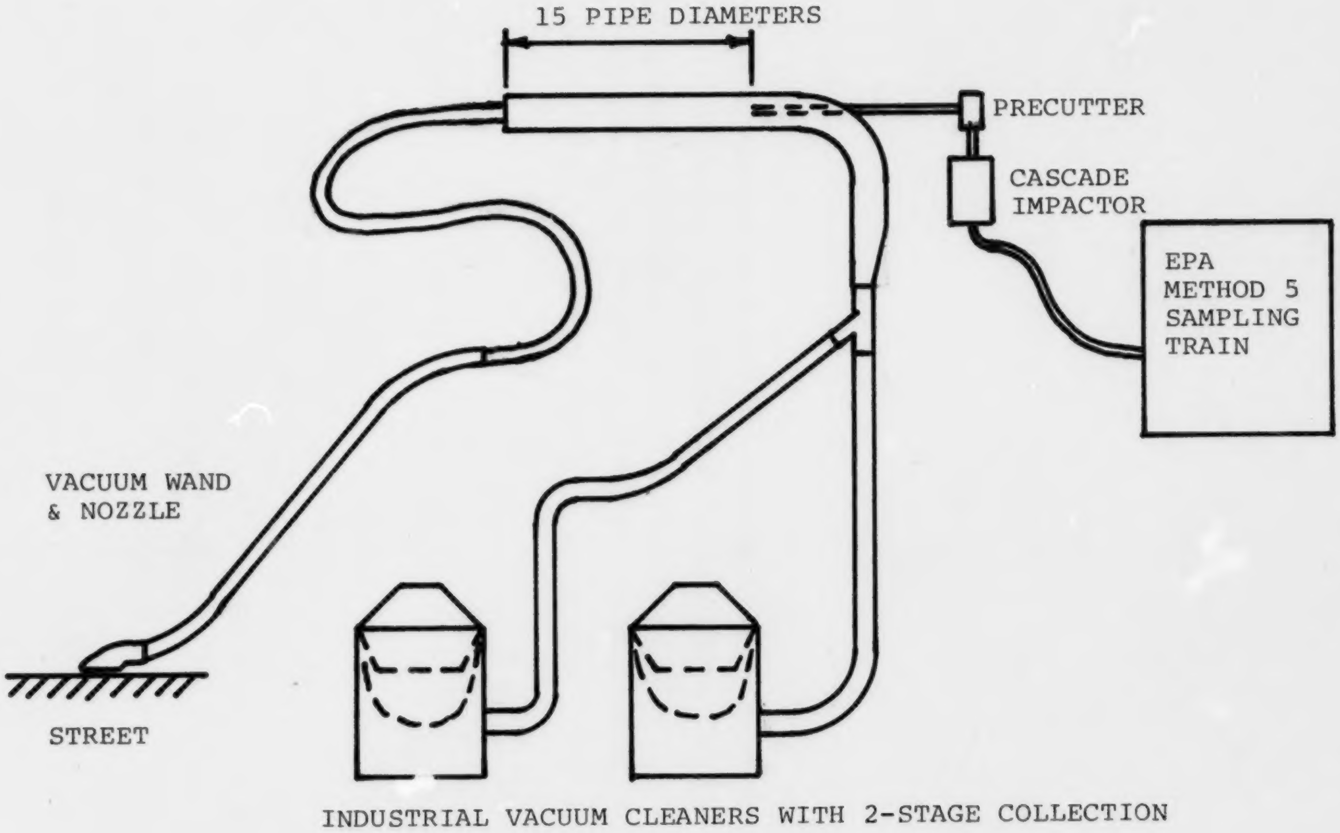

15 PIPE DIAMETERS
PRECUTTER
CASCADE IMPACTOR
EPA METHOD 5 SAMPLING TRAIN
VACUUM WAND & NOZZLE
STREET
INDUSTRIAL VACUUM CLEANERS WITH 2-STAGE COLLECTION

Figure 11. Bellevue sampler.

Figure 12. Its cross-section at the street is triangular and is 13.3 cm (5.25 inches) wide. The nozzle contacts the street surface during sampling, and the leading edge is elevated manually 0.3 cm (0.1 in) above the street surface to permit an adequate air flow and to collect the larger solids. The dirt is collected in each vacuum cleaner canister, and the vacuum cleaner air is filtered by a pair of cloth filters in each canister. The canister sample is later sized by sieve analysis.

Sieve Analysis

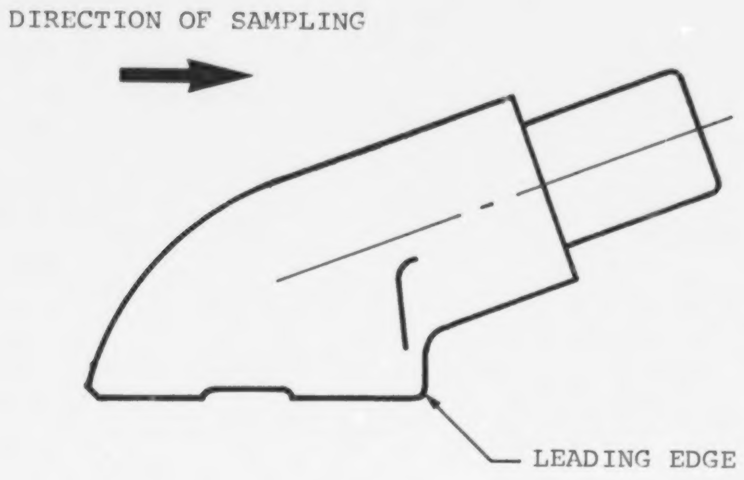
Dirt collected by the vacuum cleaners were size fractionated with sieves. In Bellevue, the analysis was done by Bellevue laboratory personnel. The sieves were 63 mm and Tyler sieve numbers 9, 16, 32, 60, 250 and 400 which correspond to opening sizes of 6,300, 2,000, 500, 250, 125, 63, and 37 microns. (Note: the opening of standard Tyler No. 400 sieve is 38 microns. However, in Bellevue's report on water run-off, an opening size of 37 microns was used).

In San Diego, the sieve analysis was done by A.P.T. and the sieves used were Tyler No. 3½, 9, 32, 60, 250, and 400. The corresponding openings are 5,600, 2,000, 500, 125, 63, and 38 microns.

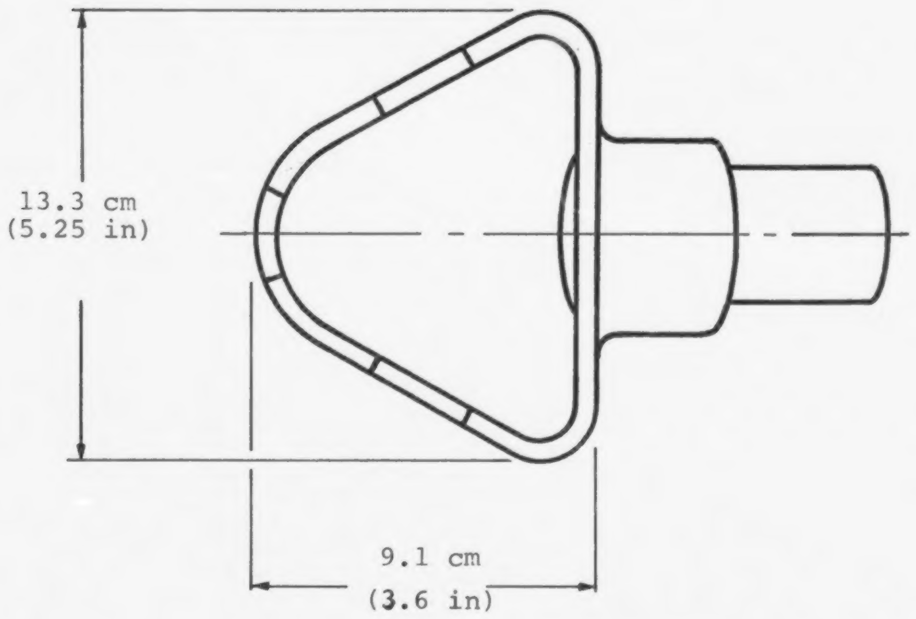
Correlation of the Samplers

The A.P.T. and Bellevue samplers were designed for different objectives. The A.P.T. sampler is for sampling only those particles that can be re-entrained by air movement. Therefore, dust deposited in cracks will not be removed from the street by the A.P.T. sampler. The Bellevue sampler was designed to collect all of the particles that can be carried off by rain, including those deposited in the cracks. Thus, the Bellevue sampler collects more dust than the A.P.T. sampler.

In order to allow comparison of the data obtained in this study with other A.P.T. and City of Bellevue data, both the


DIRECTION OF SAMPLING
LEADING EDGE

SIDE VIEW


13.3 cm
(5.25 in)
9.1 cm
(3.6 in)

BOTTOM VIEW

Figure 12. Pickup head of Bellevue sampler.

A.P.T. sampler and the Bellevue sampler were used for sampling during the first 7 tests in Bellevue, to establish a correlation between the samplers. These 7 tests yielded 13 pairs of samples for correlating the two samplers (one test did not have samples after sweeping because it rained after the sweeping).

A correlation of the samplers, based on the total, dry weights collected by the samplers, is illustrated in Figure 13. The first run does not agree with the other 6 runs because the street contained large rocks that the Bellevue sampler picked up, but the A.P.T. sampler did not. A least-squares, linear regression for runs 2 through 7 yields the following correlation equation:

$$Y = -0.94 + 0.82\ X \tag{1}$$

where

X = street dust concentration measured with Bellevue sampler, g/m^2

Y = street dust concentration measured with A.P.T. sampler, g/m^2

The regression correlation coefficient is 0.97. The 90% confidence belt is also plotted in Figure 13. Except for the 2 samples of Run No. 2, all of the data points of the regression lie within this confidence belt.

As expected, the A.P.T. sampler collected less dust (an average of 18% less) than the Bellevue sampler.

DUST DISPERSION

As a sweeper operates, dust is dispersed at the gutter broom and the pickup broom or head. The dispersed dust of the Tymco and the ISS were sampled with filters mounted in fixed positions on the sweeper. Two glass-fiber filters were mounted on the top of the pickup head at its leading edge. The two filters were 15 cm (6 in.) and 76 cm (30 in.) from the curbside end of the pick up

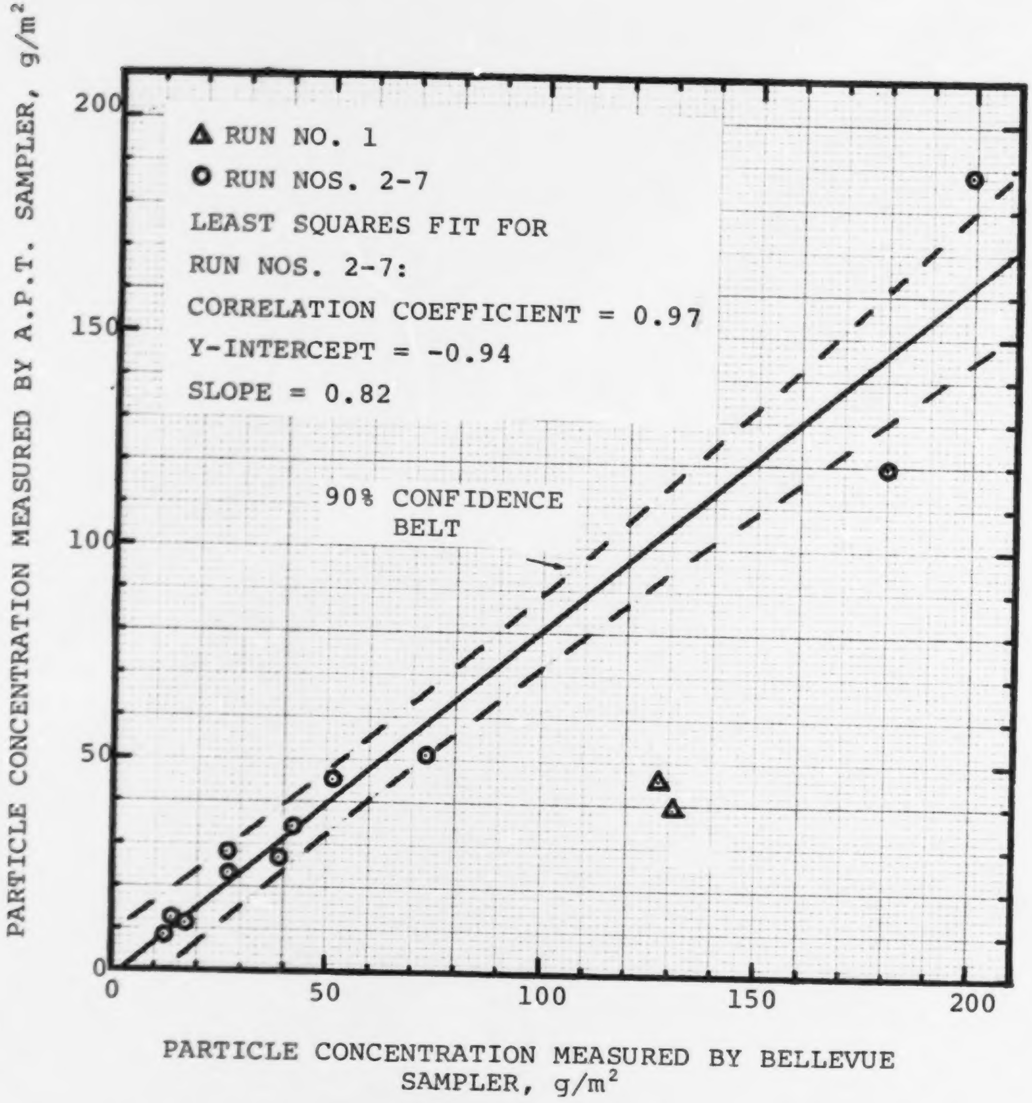


Figure 13. Correlation of sampling methods (based on total, dry weights collected).

head. Each filter was operated at a flowrate of 28 l/min (1 cfm) that was controlled and measured by an EPA Method 5 sampling train, located in the sampling trailer shown in Figure 7.

Since the volumes of the dust plumes are unknown, the measured dust concentrations allow only relative comparisons of the dust dispersion at the sampling points.

ISS SCRUBBER EMISSION

The mass emission rate and the size distribution of the particles emitted by the ISS scrubber were determined by sampling the outlet of the scrubber with a cascade impactor. The gas sample flow rate was monitored and regulated with an EPA Method 5 sampling train located in the sampling trailer.

SECTION 5

RESULTS

TEST AREAS AND SWEEPERS

Bellevue Tests

In Bellevue, WA, street sweepers were evaluated in two areas: SE 30th St. and Surrey Downs. SE 30th St. is a 13.6 m (44.5 ft) wide, dead-ended street of a light-industrial park. The experiments in the Surrey Downs area were made on two similar streets in the same residential neighborhood. The widths of the two streets were 9.1 and 9.8 m (30 and 32 ft). All of the streets of the Bellevue test areas were asphaltic concrete and had vertical, Portland-cement-concrete curbs. All of these streets had only 2 traffic lanes.

At both Bellevue areas, three types of sweepers were tested: two Mobil broom sweepers, the Tymco vacuum sweeper, and the ISS. The Tymco sweeper is actually the ISS with the gutter broom hoods removed and the air flows from the hoods and to the scrubber shut off. A total of 29 tests were made in Bellevue during September and October of 1982.

For the SE 30th Street tests, the sweeping lane samples were taken from a 2.4 m (8 ft) wide lane with one of its edges against the curb. The Mobil was operated with the streetside gutter broom turned off and its swept path was 2.1 m (7 ft) wide. The Tymco was also operated with the streetside gutter broom turned off, and its swept path was 2.7 m (9 ft) wide. The ISS was operated with both gutter brooms on, and its swept path was 3.3 (10.8 ft) wide. In Bellevue, the sweepers are normally operated with the street side broom off. Therefore, all sweepers except the ISS, were operated in this mode at this site. Bellevue has data in their data base which had both of the brooms on. To fully evaluate the potential of the ISS in reducing the water run-off problems, the ISS was operated with both brooms on so that a comparison could be made with their data base.

For the tests in Surrey Downs, the sweeping lane samples were taken from a 3.0 m (10 ft) wide lane with one of its edges against the curb. In these tests, all sweepers were operated with both the curbside and the streetside gutter brooms in operation. The swept path of the Mobil was 2.7 m (9 ft), while the paths of the Tymco and the ISS were 3.3 m (10.8 ft) wide.

San Diego Tests

The areas for the San Diego tests were on Mission Boulevard and Morena Boulevard. Mission Blvd., between San Fernando Place and West Mission Bay Drive, is in a neighborhood that is commercial, residential, and recreational (beach parks). Mission Blvd. has 4 traffic lanes and a curbed island median. From median curb to sidewalk curb the distance is 8.5 to 9.8 m (28 to 32 ft). The half of street samples at Mission Blvd. were taken from the sidewalk curb to the paint stripe between the two traffic lanes, that is the strip samples 1 parking lane and 1 traffic lane, as Figure 8 shows. This was done to avoid sampling the dirt near the island curb, and to allow direct comparison of Mission Blvd. results with those of the other test areas. The width of this sample strip is 5.3 to 6.5 m (17.4 to 21.4 ft).

Morena Blvd., between Jutland Drive and Ariane Drive, is in a commercial area, has 2 traffic lanes, and is 15.2 m (50 ft) wide. During the tests there was an inactive, partially-completed construction site immediately adjacent to the test sections. Both San Diego streets were asphaltic concrete and had vertical, Portland-cement-concrete curbs.

Along with the Tymco and the ISS, Mobil and FMC broom sweepers of the City of San Diego were tested. All four sweeper types were tested at Mission Blvd. At Morena Blvd., the City of San Diego did not use Mobil sweepers, so only FMC sweepers, the

Tymco sweeper and the ISS were tested. A total of 28 tests were made in San Diego during January, February, August, and September of 1983.

For the San Diego tests, the sweeping lane samples were taken from a 2.4 m (8 ft) wide lane with one of its edges against the curb. The ISS, Mobil, and FMC sweepers were tested with the gutter brooms of both sides in operation, and the widths of their swept paths were: 3.3 m (10.8 ft) for the ISS, 2.9 m (9.5 ft) for the Mobil, and 2.7 m (9 ft) for the FMC sweeper. The Tymco was tested with the streetside gutter broom turned off, giving a 2.7 m (9 ft) wide swept path, which approximately equals the path width of the Mobil and FMC.

DESCRIPTION OF STREET SOLIDS

Distribution On The Street

To gain information on the amount of the street solids that are within the sweeping lane, the initial solids of the sweeping lane are plotted versus the initial solids of the half-of-street in Figures 14 through 17 (one figure for each test area). These figures also contain linear regression lines. The correlation coefficients of the linear regressions range from 0.87 to 0.97.

The linear regression line for SE 30th St. indicates that 70 to 80% of the half-of-street solids are within the sampled sweeping lane. At Surrey Downs, 80 to 100% of the solids are in the sweeping lane; while at Mission Blvd., 100% are in the sweeping lane. The Morena Blvd. linear regression indicates that there is a constant 15 kg/curb-km (53 lb/curb-mi) in the area outside the sweeping lane.

This distribution of street dust agrees with the measurement results reported by the City of Bellevue. The City of Bellevue measured the distribution of street solids on 110th Avenue SE. They found that: 45 to 55% of the solids were within 0.51 m (1.7 ft) from the curb, 75 to 80% were within 1.2 m (4.0 ft) from the curb, and 85 to 95% were within 2.4 m (8.0 ft) from the curb.

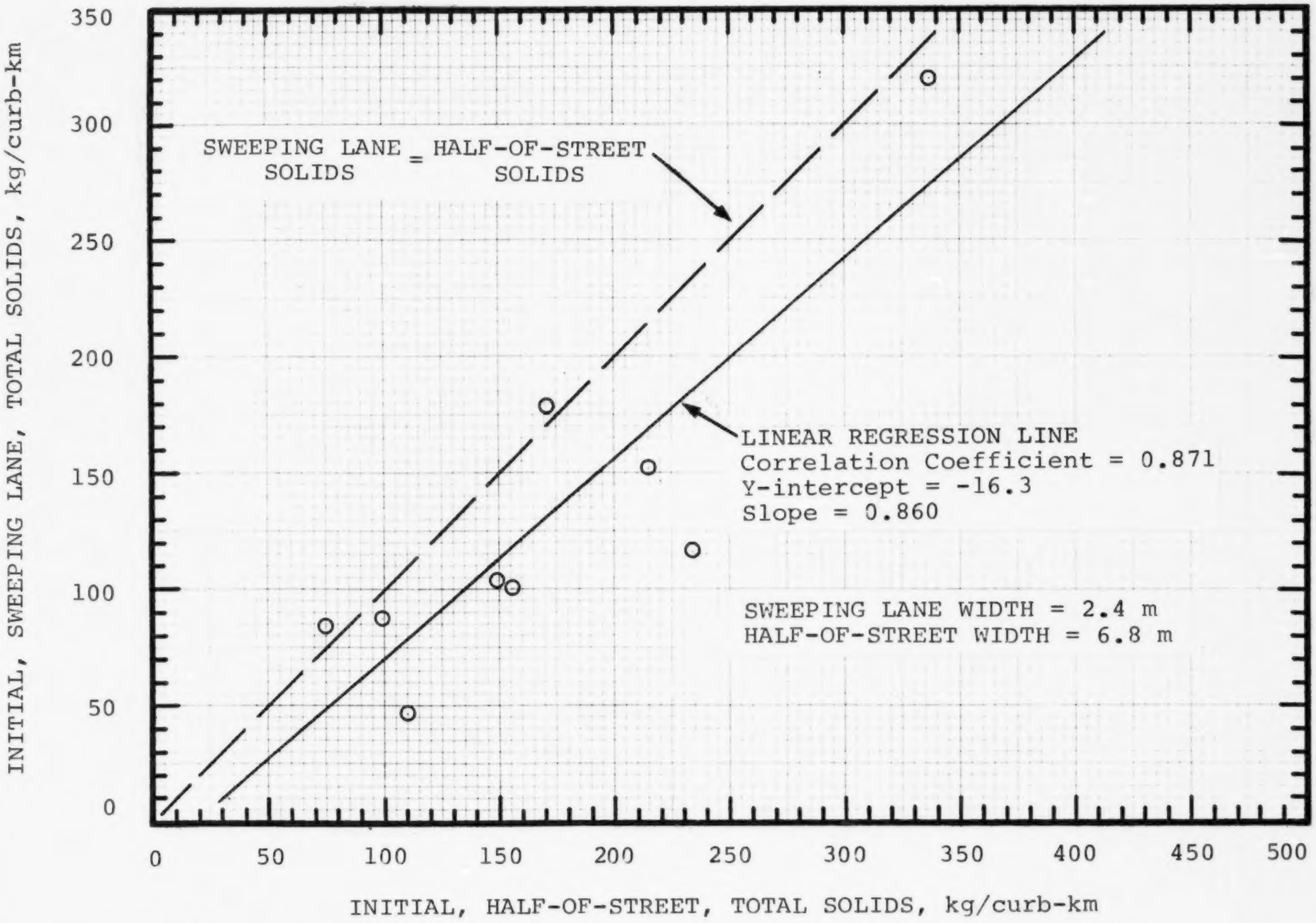


Figure 14. Comparison of initial samples at SE 30th St.

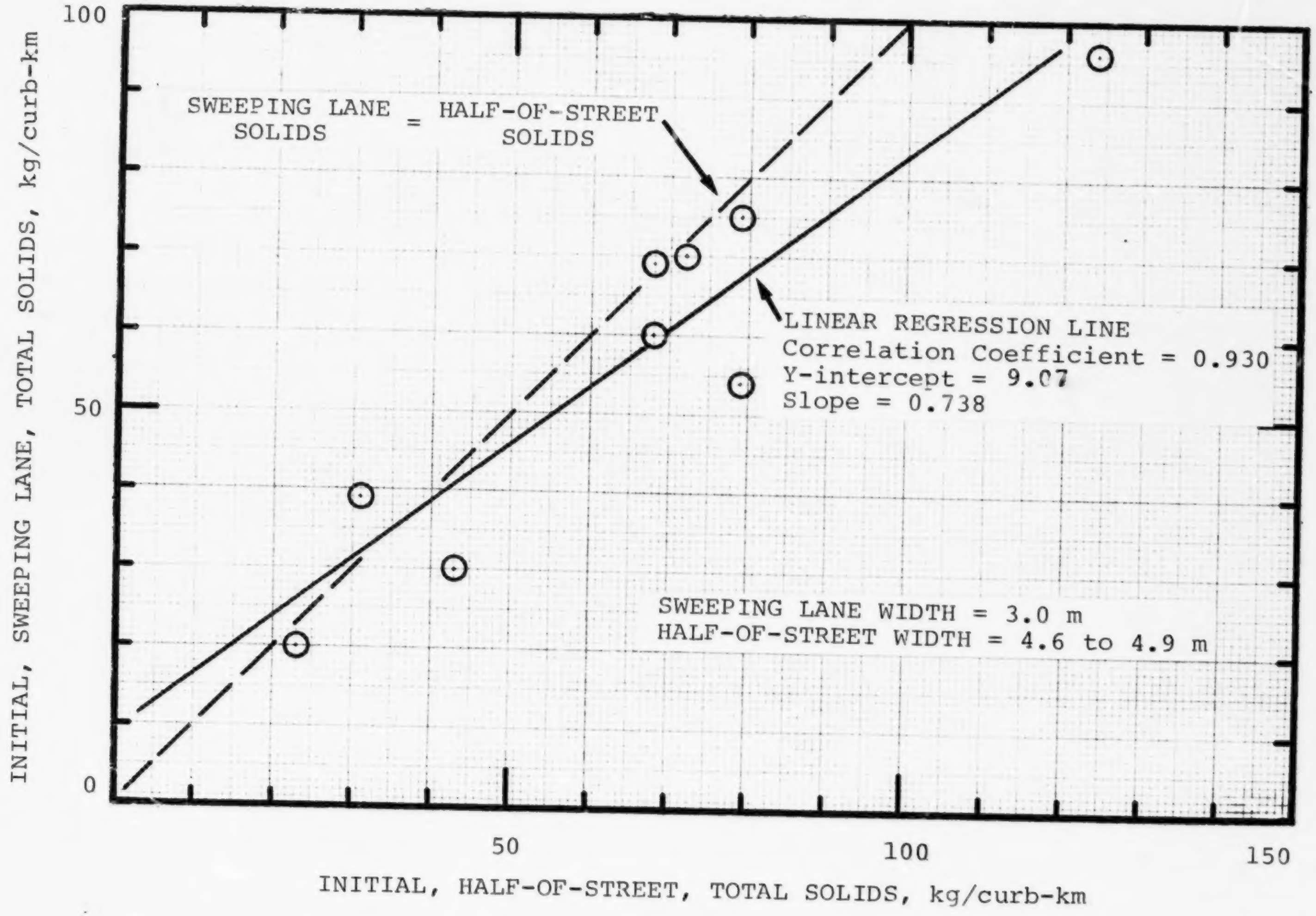


Figure 15. Comparison of initial samples at Surrey Downs.

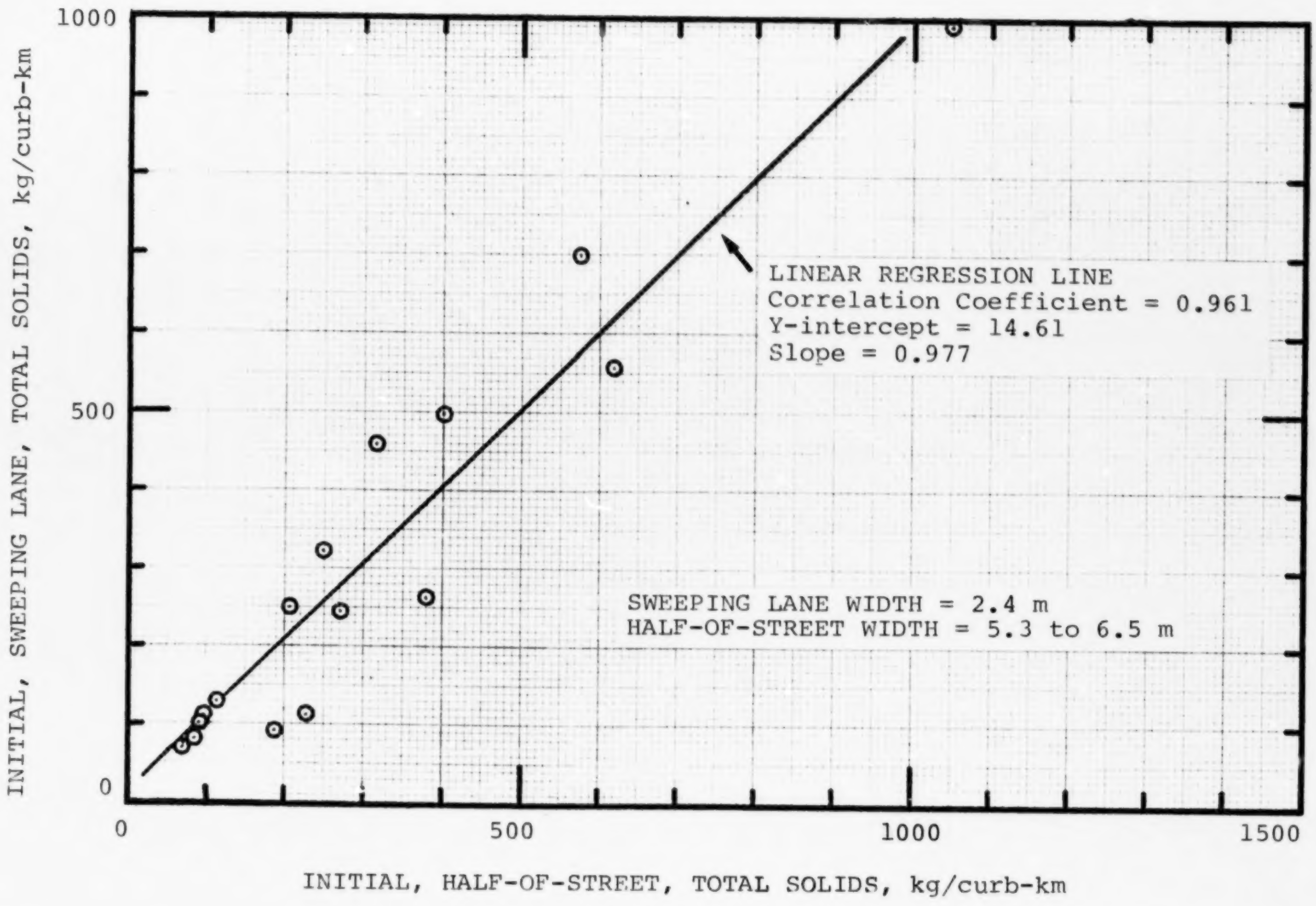


Figure 16. Comparison of initial samples at Mission Blvd.

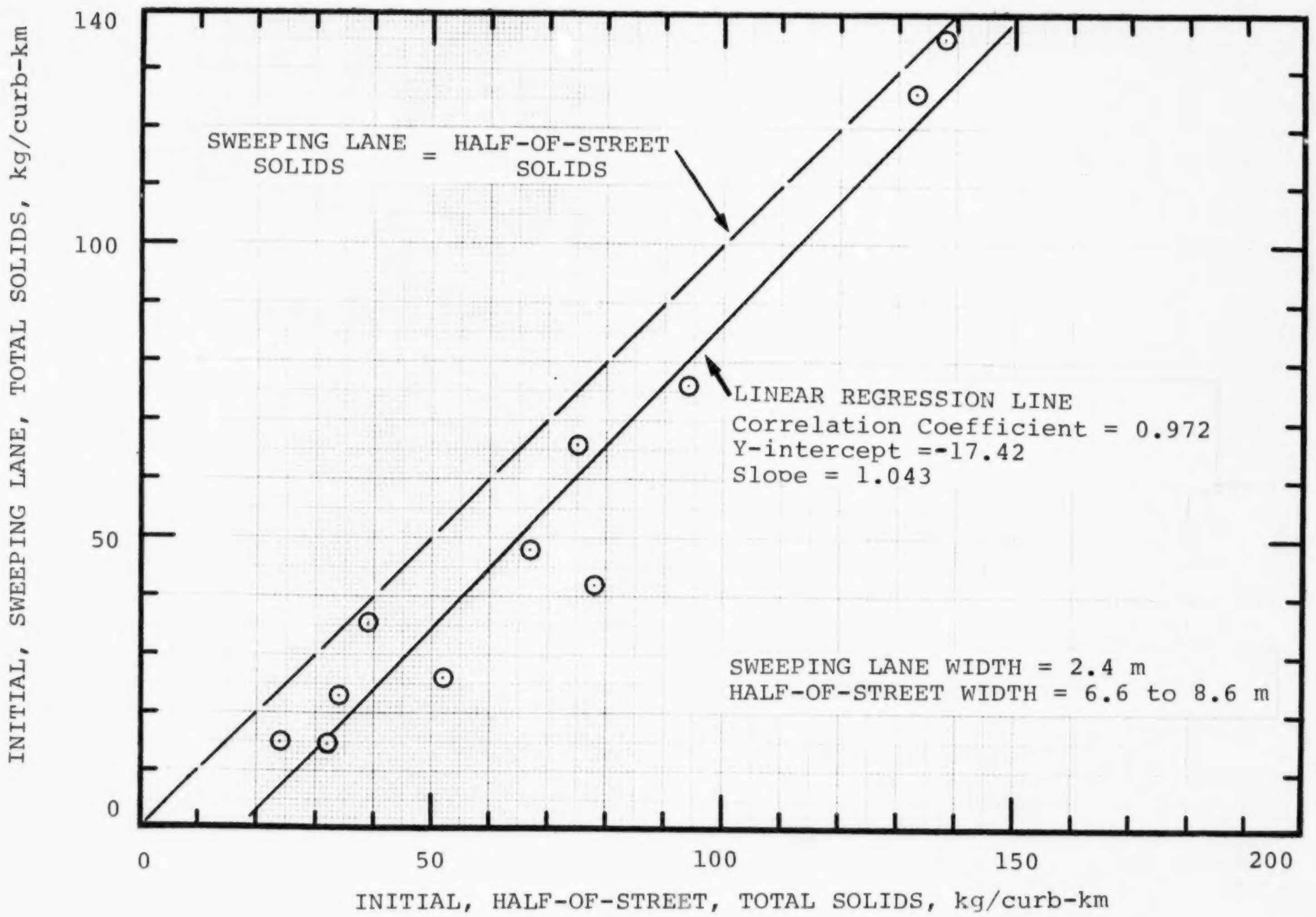


Figure 17. Comparison of initial samples at Morena Blvd.

Size Distributions

Typical size distributions of the initial street solids are shown in Figures 18 and 19. The mass median diameters of the street solids vary from 200 microns to 500 microns. The particles of Surrey Downs are coarser than other areas, probably because Surrey Downs is a residential area and has less traffic to pulverize the street dust.

STREET SWEEPER CLEANING PERFORMANCE

Parameters

The street cleaning performance of a street sweeper depends on the following major parameters: the amount of solids on the street, the size distribution of the solids, street surface characteristics (such as texture, amount of cracking, depth of cracks, etc.), and the capabilities of the sweeping machine.

To accommodate the dependence upon the amount of solids, graphs of the residual loading of solids versus the initial loading of solids was the method used to describe street sweeper performance in this report. The influence of the size of the solids is presented by performance graphs for various ranges of particle sizes (in addition to graphs for the total street solids). . To eliminate the effects of street surface characteristics each graph is for only one test area.

The presentation of sweeper performance in terms of removal efficiency as a function of particle size was considered. However, this method was found to be not suitable, because the removal efficiency strongly depends on the amount of solids on the street.

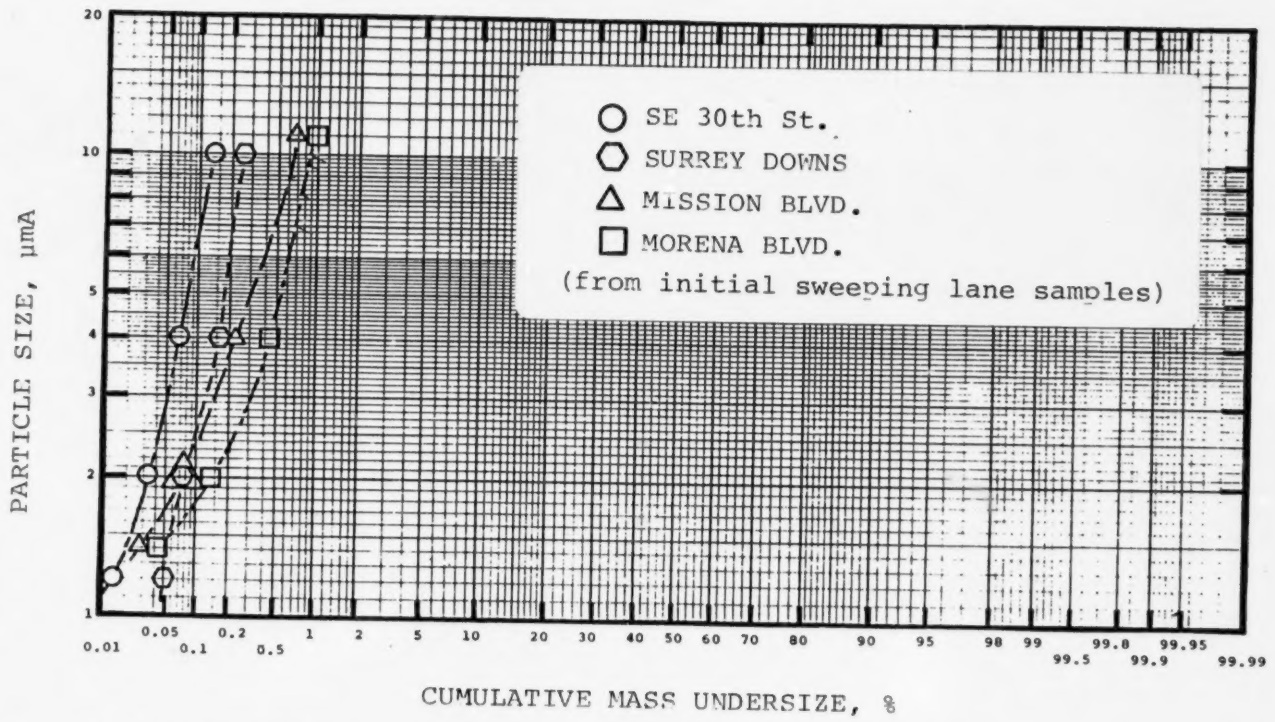


Figure 18. Size distribution of street solids from 1 to 11 μmA, based on cascade impactor samples.

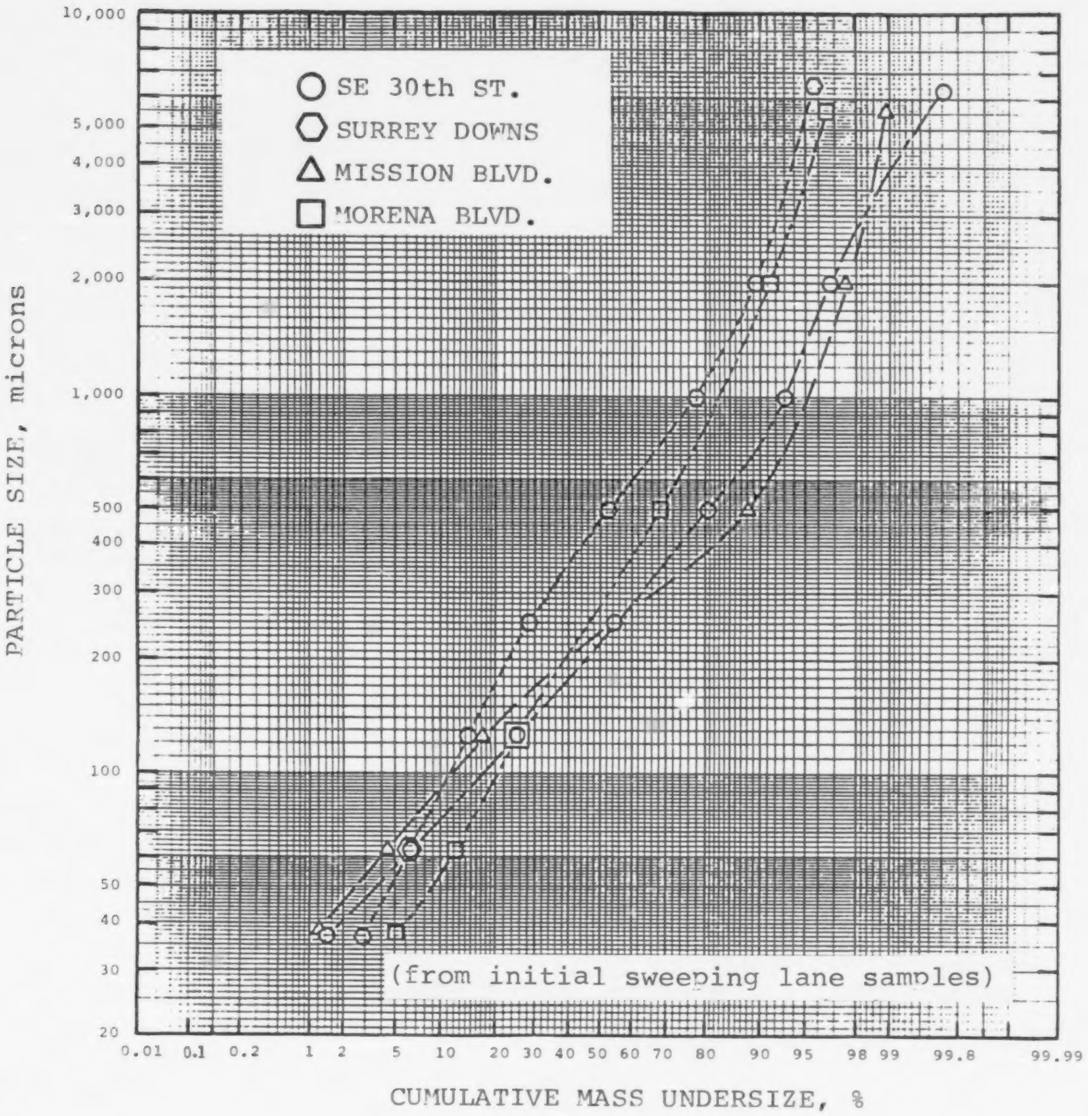


Figure 19. Size distribution of street solids from 37 to 6300 microns, based on sieve analyses.

Total Street Solids

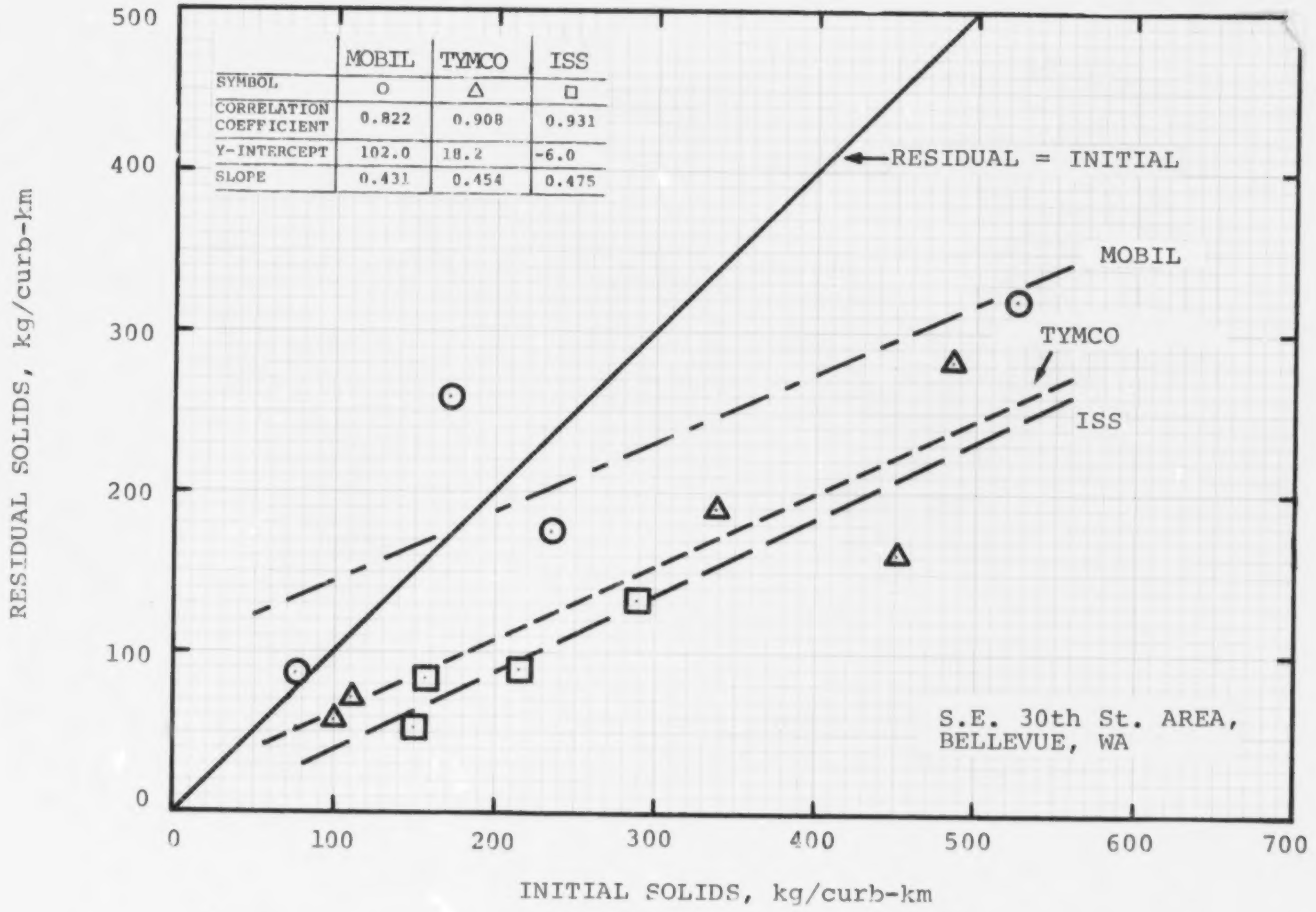
Half of Street Residuals

The performances of the sweepers for total solids (all particle sizes), based on the half-of-street samples, are shown in Figures 20 through 23 (one figure for each test area). Depending on initial street dust loading, the broom sweepers removed 0 to 40% of the solids, while the Tymco sweeper removed 30 to 55% and the ISS removed 30 to 60% of the solids. Therefore, based on half-of-street results, the Tymco sweeper was only slightly less effective than the ISS, but each were more effective than the broom sweeper.

During the tests, the sweeper drivers were instructed to drive at 8 km/hr (5 mi/hr), unless the amount of street solids was higher than usual (by visual inspection). When there were high solids the drivers were told to drive at slower speeds that were appropriate for the amount of solids. This was done to simulate common street sweeping practice. However, one test at Mission Blvd. does not meet this speed guideline. In this test, the ISS was operated at 8 km/hr (5 mi/hr) while the amount of solids was much higher than normal. This test is indicated with a solid square in Figure 22.

Sweeping Lane Residuals

The sweeper performances for total solids, based on the sweeping lane samples, are shown in Figures 24 through 27. These figures reveal larger differences in performance between the sweepers than the half-of-street graphs, because the solids of the unswept area are not included in the residuals (as discussed earlier). The broom sweepers removed approximately 5 to 45% of the solids, and their performance curves usually have slopes of approximately 1. The Tymco removed approximately 50 to 75% of the solids, and its performance curve slopes are about 0.25. The ISS removed 50 to 85% of the solids, and its curves have slopes



	MOBIL	TYMCO	ISS
SYMBOL	○	△	□
CORRELATION COEFFICIENT	0.822	0.908	0.931
Y-INTERCEPT	102.0	18.2	-6.0
SLOPE	0.431	0.454	0.475

Figure 20. Total solids performance at SE 30th St. from half of street samples.

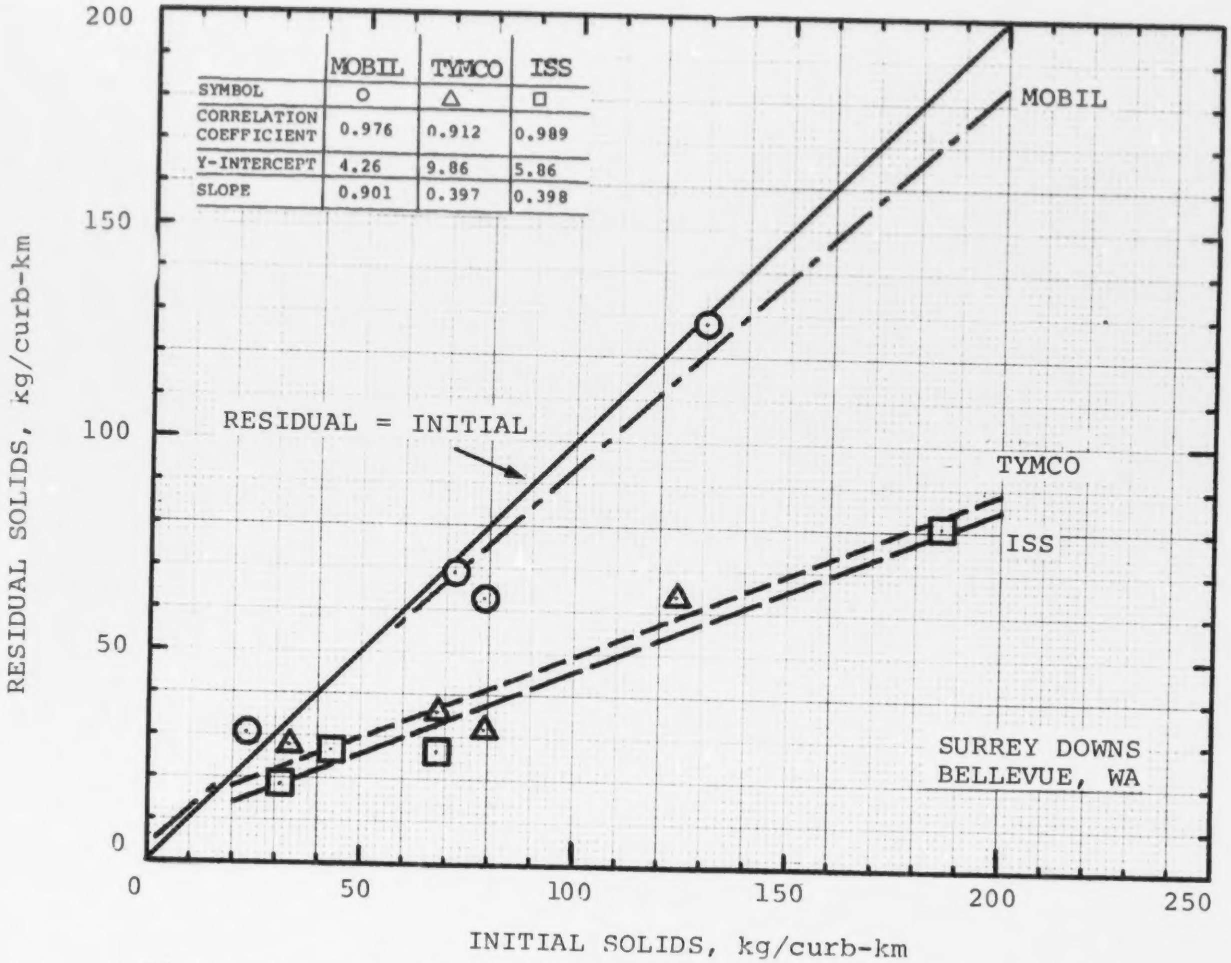


Figure 21. Total solids performance at Surrey Downs from half of street samples.

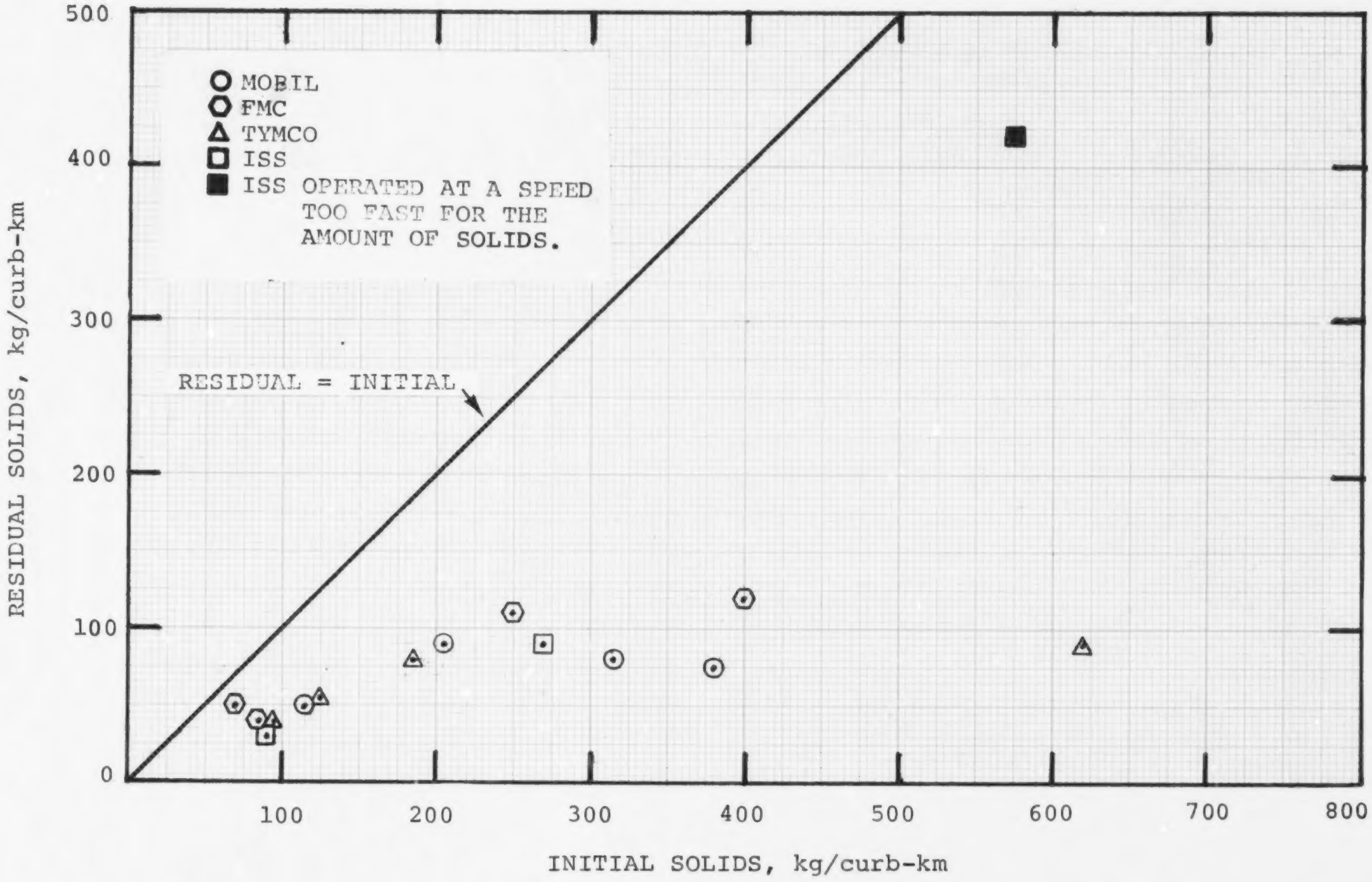


Figure 22. Total solids performance at Mission Blvd., from half of street samples.

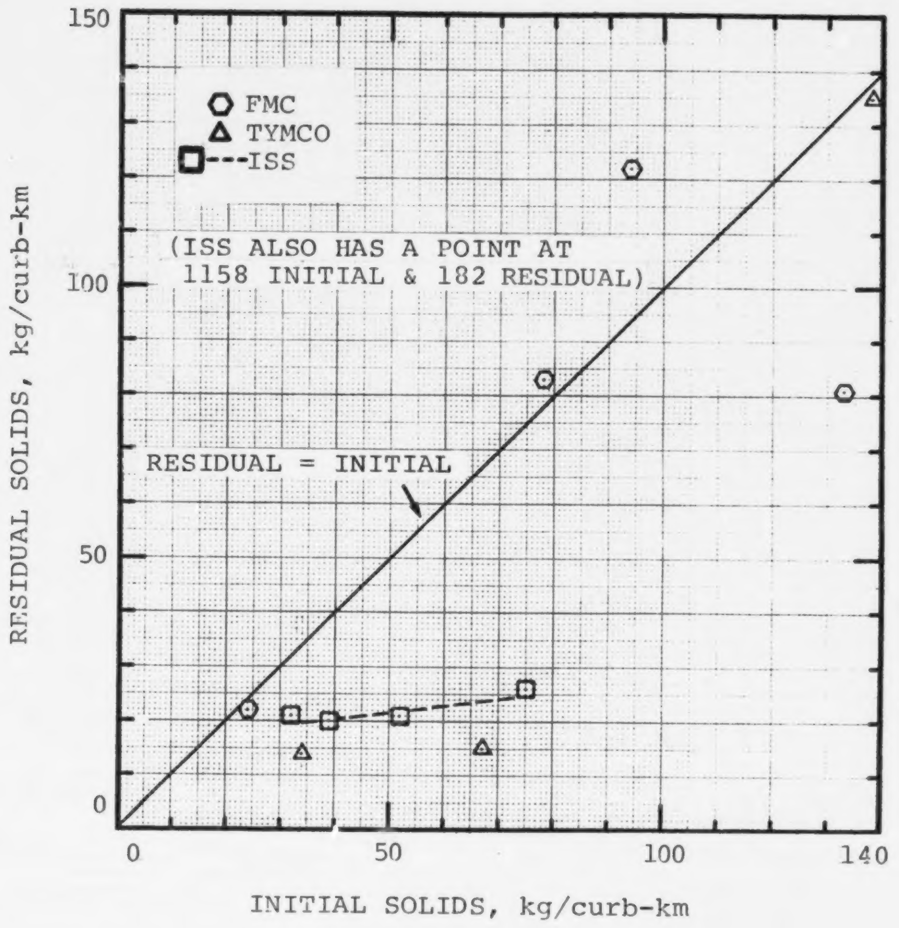


Figure 23. Total solids performance at Morena Blvd. from half of street samples.

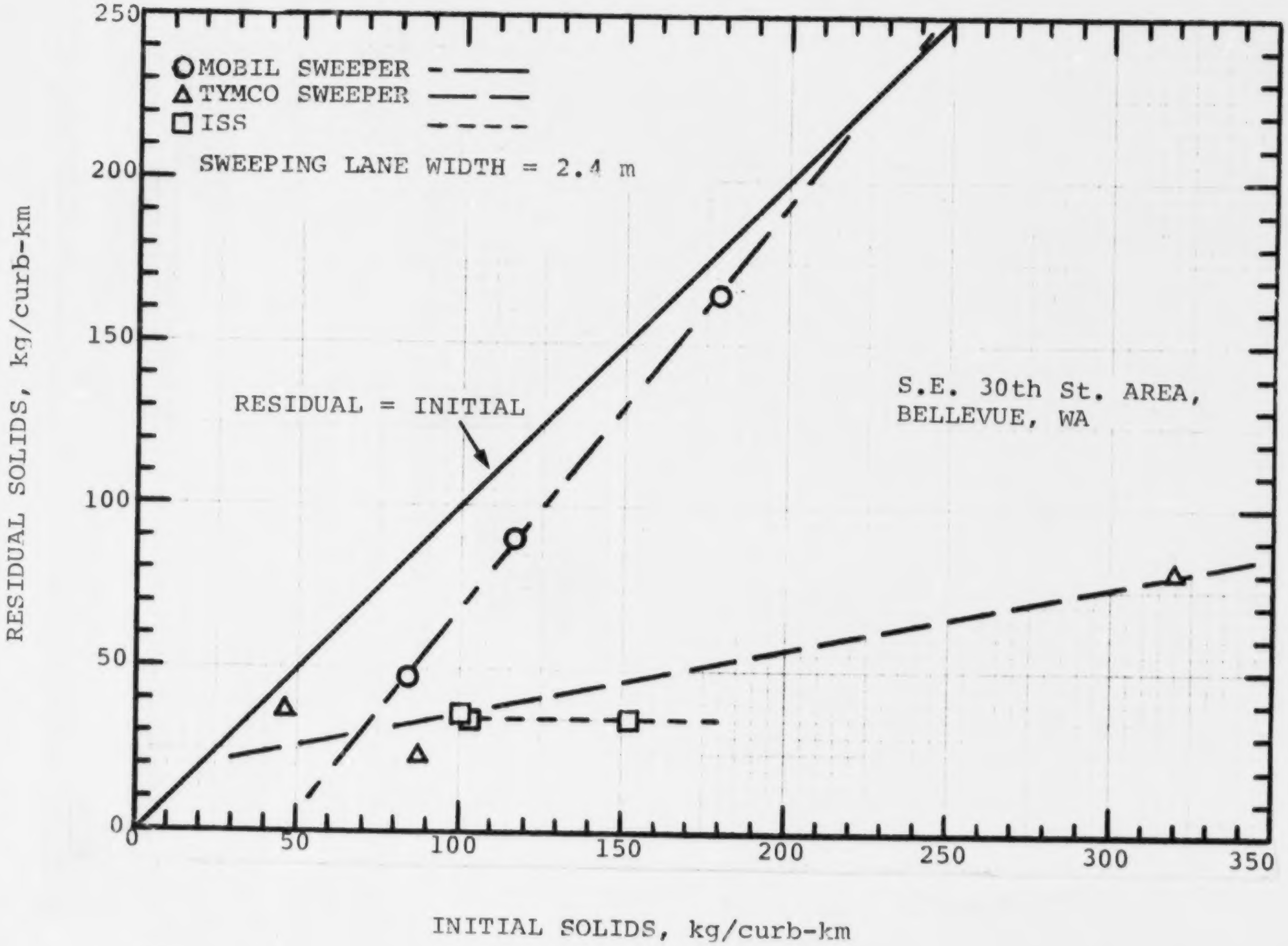


Figure 24. Total solids performance at SE 30th St. from sweeping lane samples.

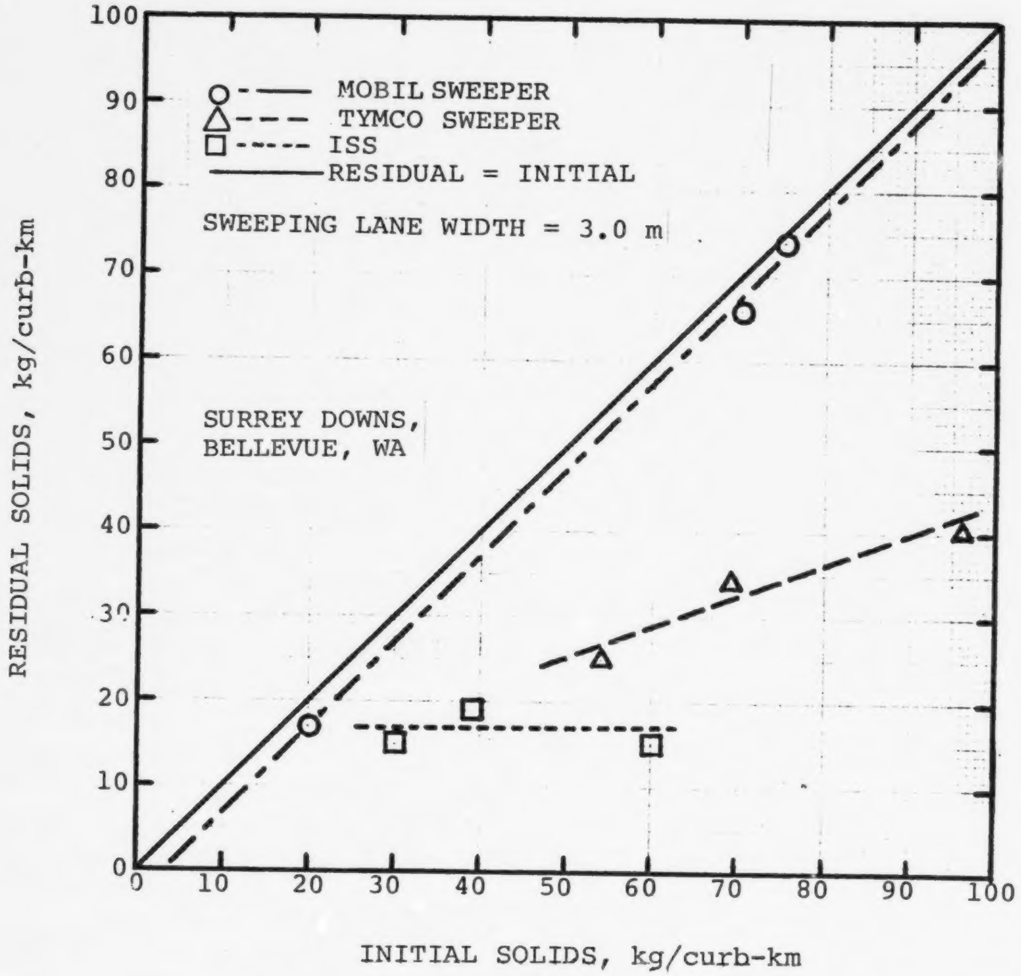


Figure 25. Total solids performance at Surrey Downs from sweeping lane samples.

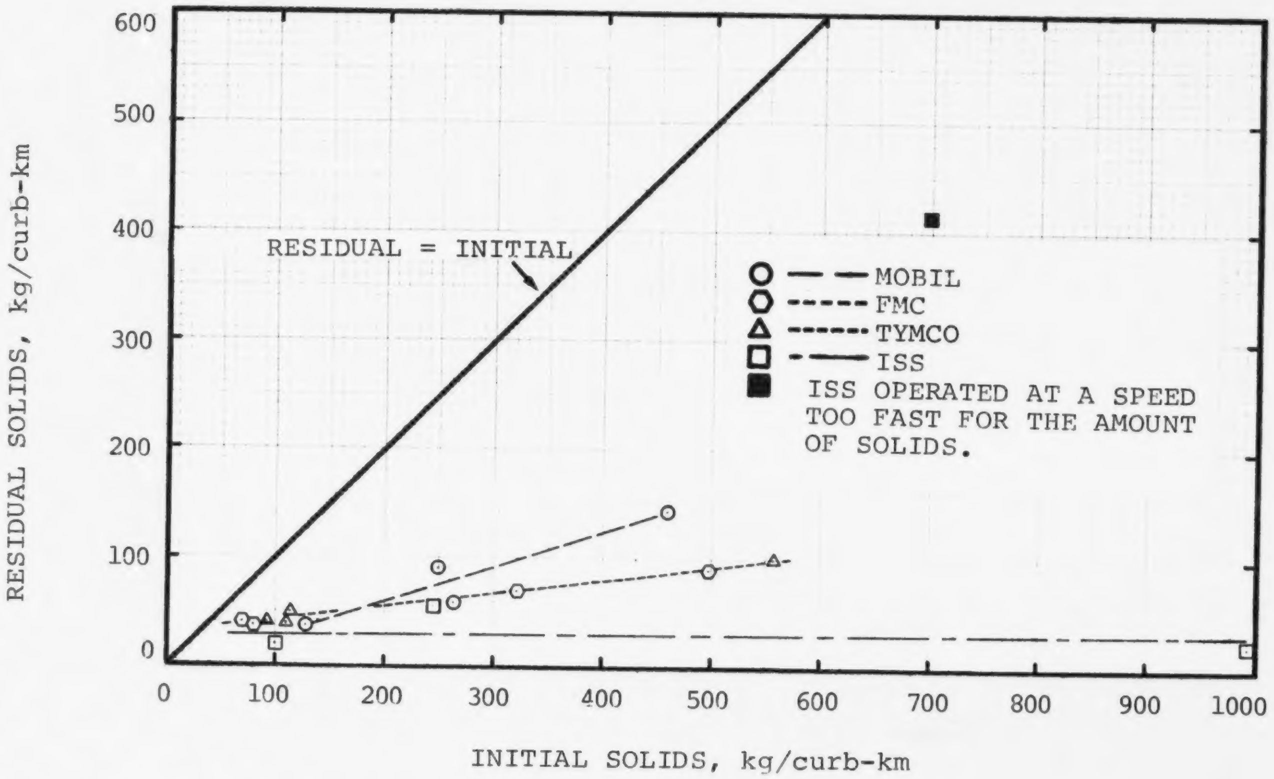


Figure 26. Total solids performance at Mission Blvd. from sweeping lane samples.

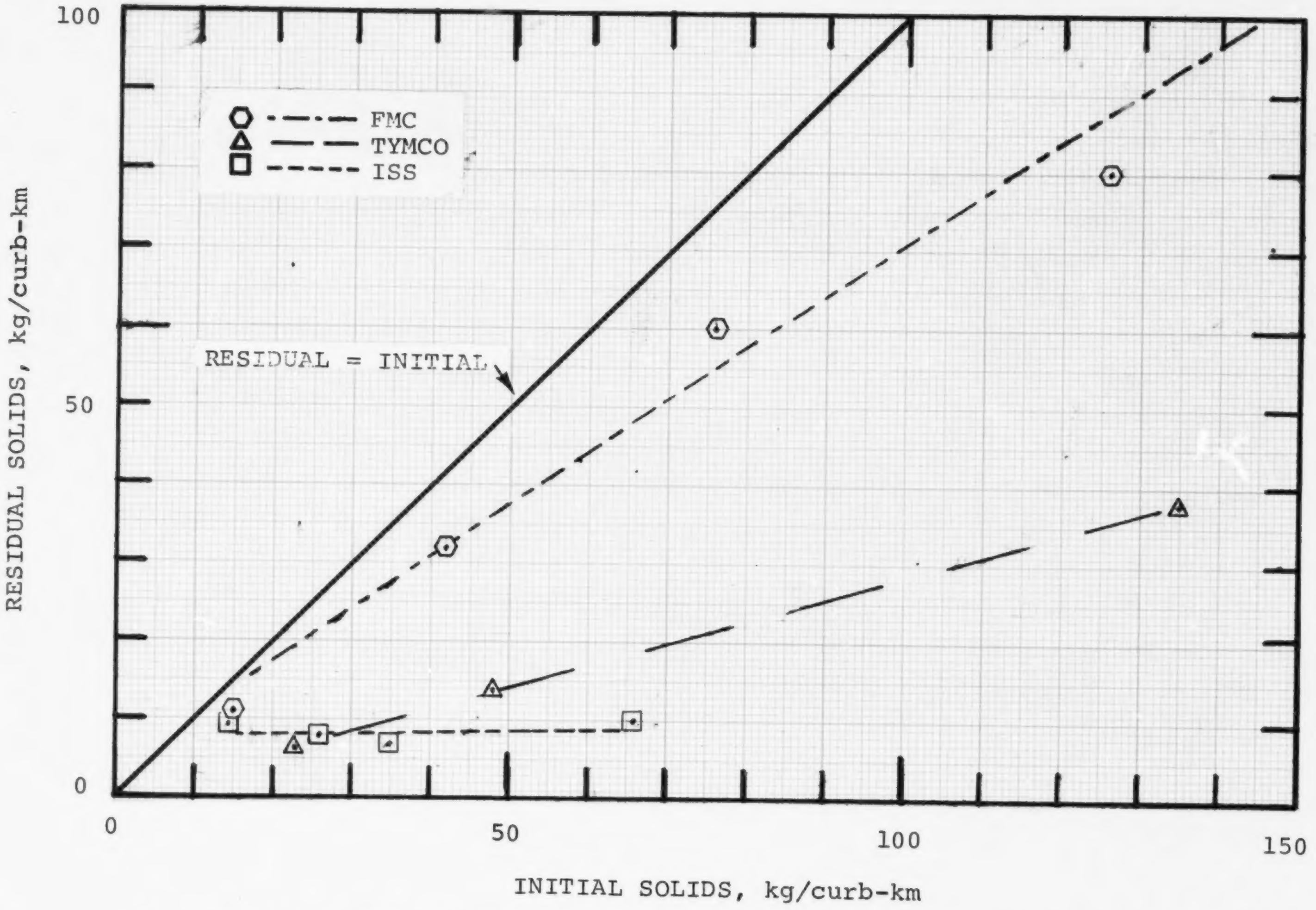


Figure 27. Total solids performance at Morena Blvd. from sweeping lane samples.

of zero. This indicates that the ISS gives a constant residual level that is independent of the amount of initial street solids.

The Mission Blvd. results differ somewhat from those of the other test areas. At Mission Blvd., the Tymco and the FMC share the same performance curve; while there is a large difference between these two sweepers at Morena Blvd. Also at Mission Blvd., comparing the Mobil and FMC broom sweepers shows that at low initial solids of around 100 kg/curb-km (355 lb/curb-mi), their performances are similar (for both half-of-street and sweeping lane). At higher initial solids, the half-of-street samples (Figure 22) indicate that the Mobil removes more solids, while the sweeping lane samples (Figure 26) indicate that the FMC removes more. A possible explanation for this difference would be that the FMC moves solids to the unswept portion of the street, but consideration of the amounts removed, as discussed below, revealed no definite evidence for movement of solids.

Figure 28 through 31 show the 90% confidence regions of least-square, linear regressions of the data. Because only 3 to 4 data points were available for each regression, the confidence regions are broad and overlap, except for Morena Blvd. where the correlation coefficients are high. Based on the Morena Blvd. results, the statistical analysis indicates that the ISS performs significantly better than the broom and vacuum sweepers.

Amounts Removed

To find out whether the sweeper dispersed solids from the sweeper lane to the un-swept area, the amounts of solids removed according to each type of sample were compared. The amounts removed are plotted against initial half-of-street solids in Figures 32 through 35. If a street sweeper had moved solids from the sweeping lane to the unswept portion of the street, then the amounts removed, based on half-of-street samples, would be lower than that based on the sweeping-lane samples. It can be seen from Figures 32 through 35 that the differences between the amounts removed for the two sample types are random and there is

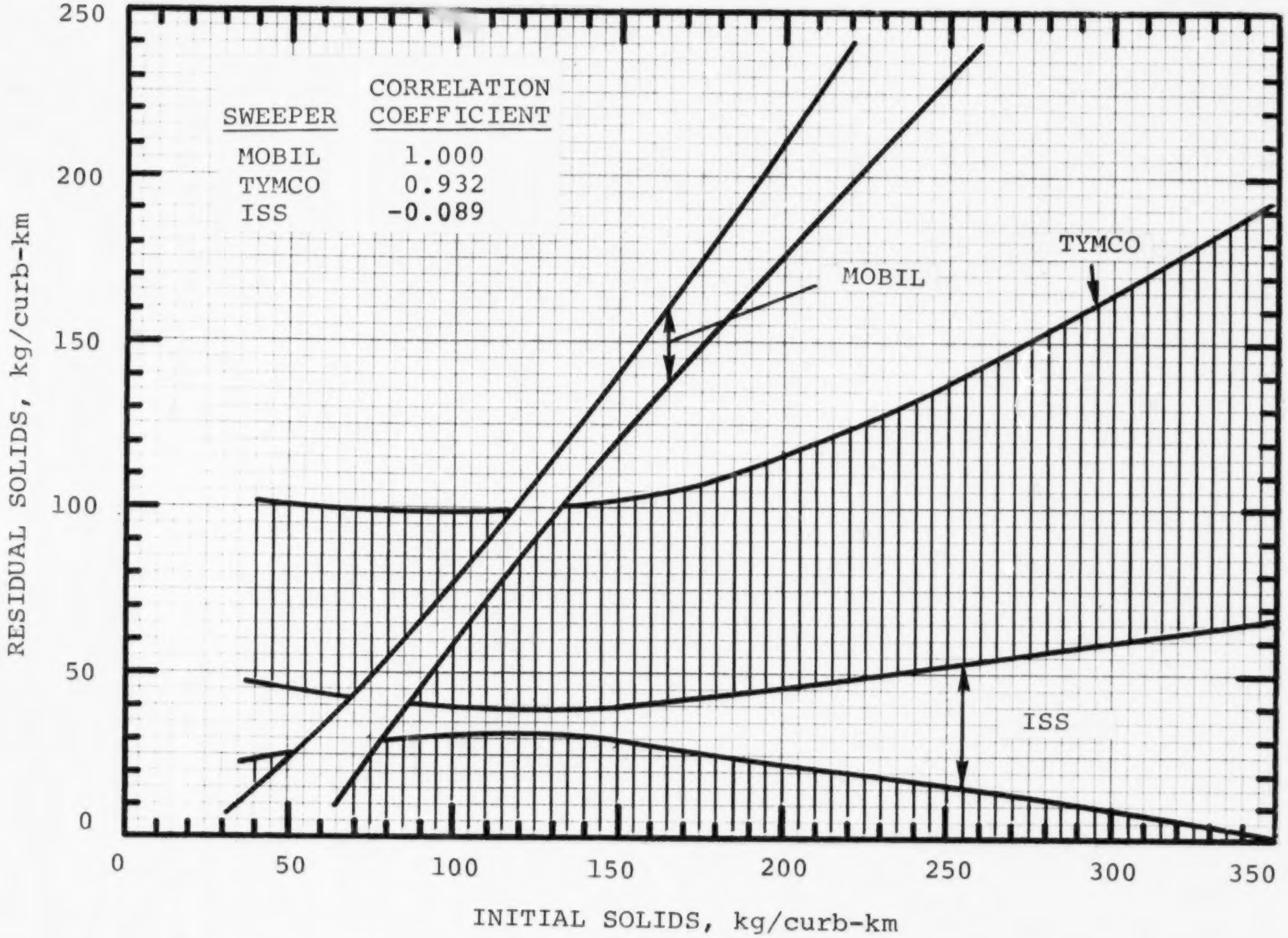


Figure 28. 90% confidence regions of total solids performances at SE 30th St., from sweeping lane samples.

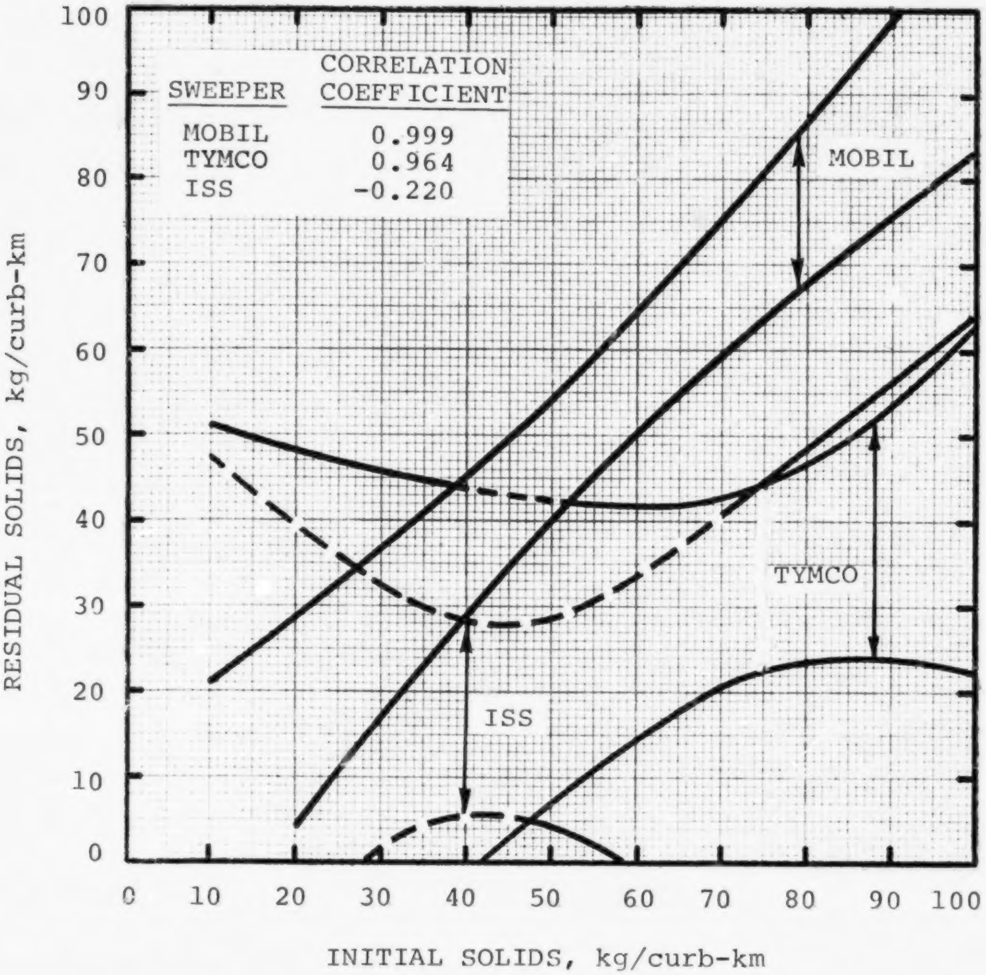


Figure 29. 90% confidence regions of the total solids performances at Surrey Downs, from sweeping lane samples.

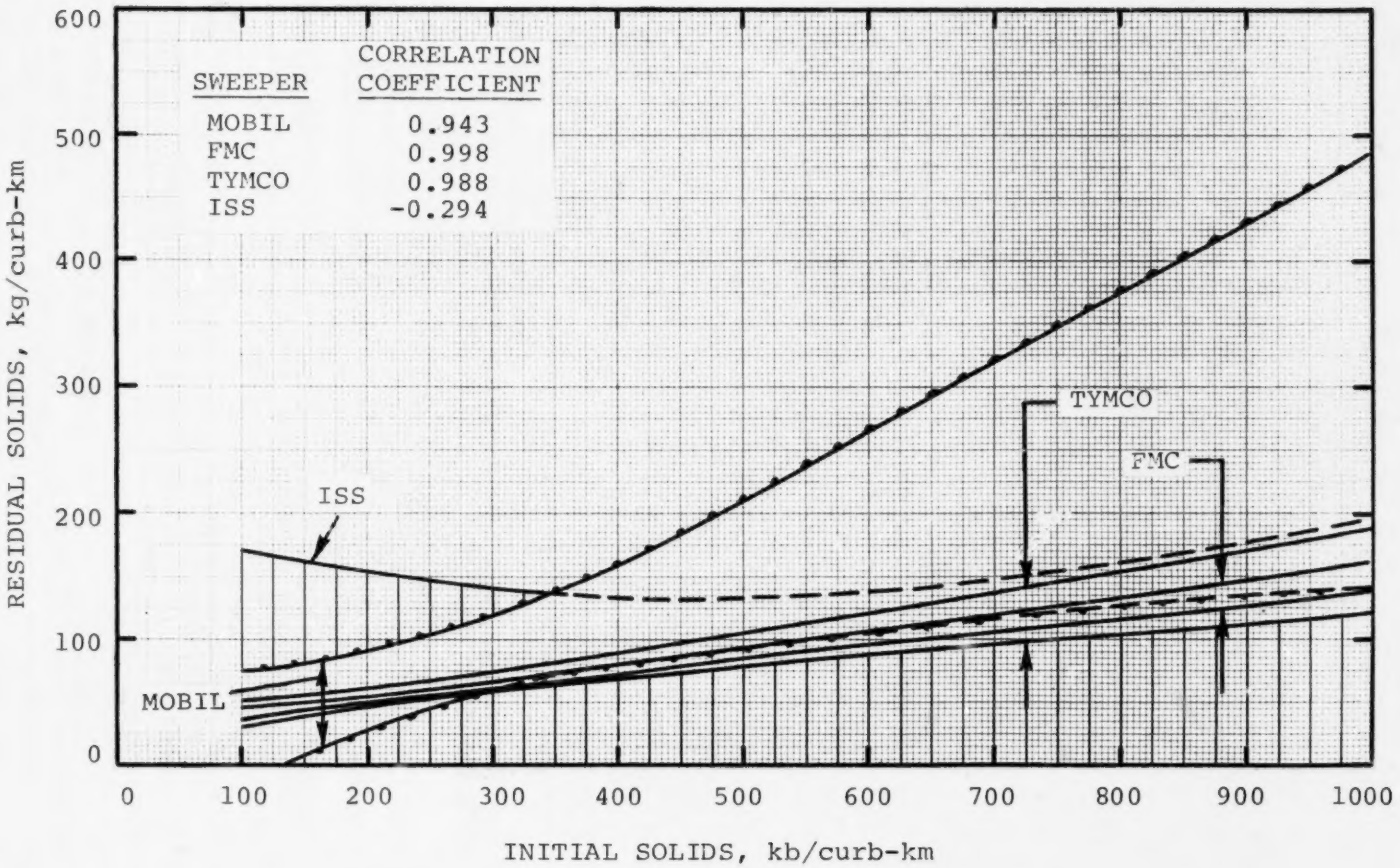


Figure 30. 90% confidence regions of the total solids performance at Mission Blvd. from sweeping lane samples.

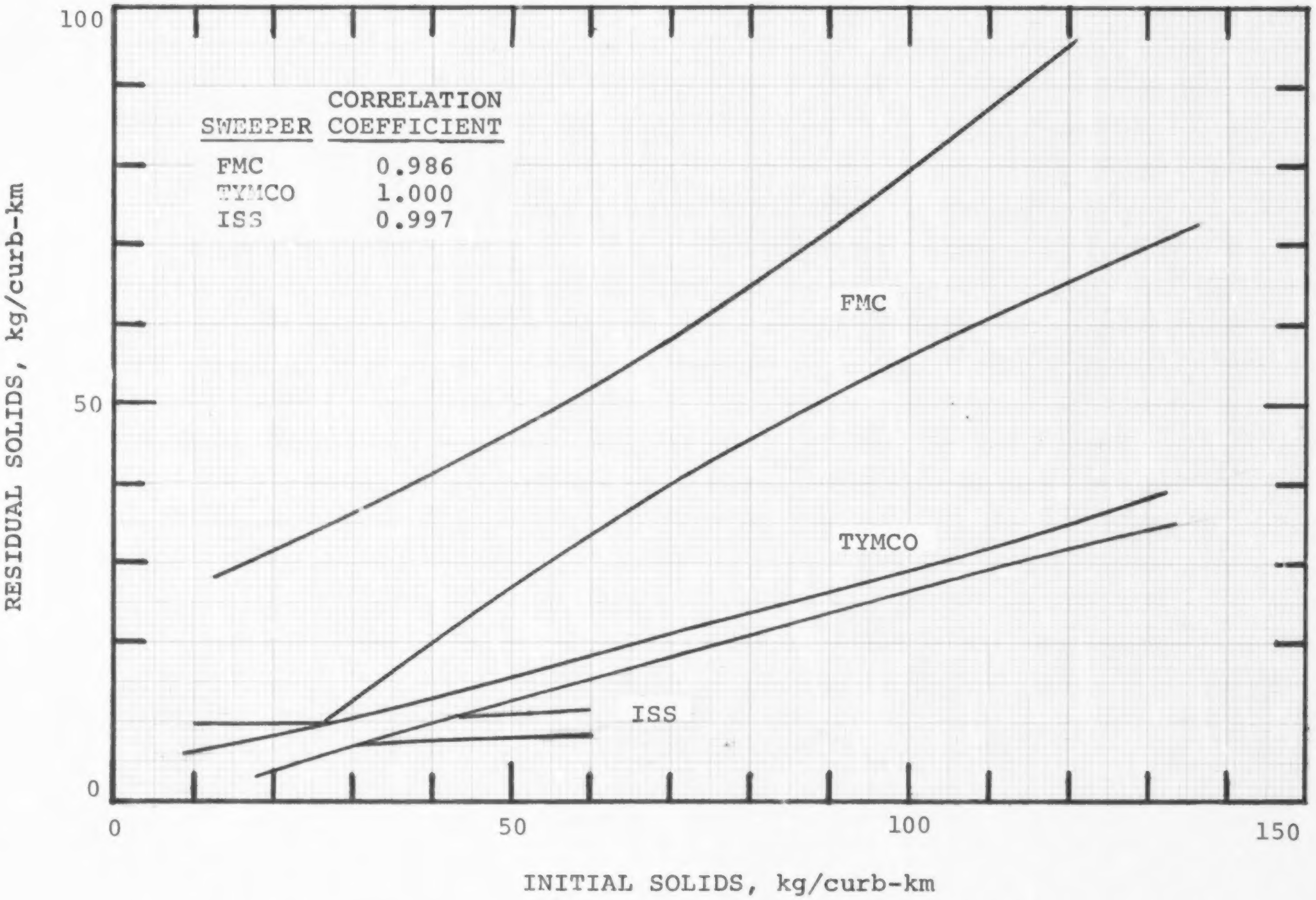


Figure 31. 90% confidence regions of the total solids performance at Morena Blvd., from sweeping lane samples.

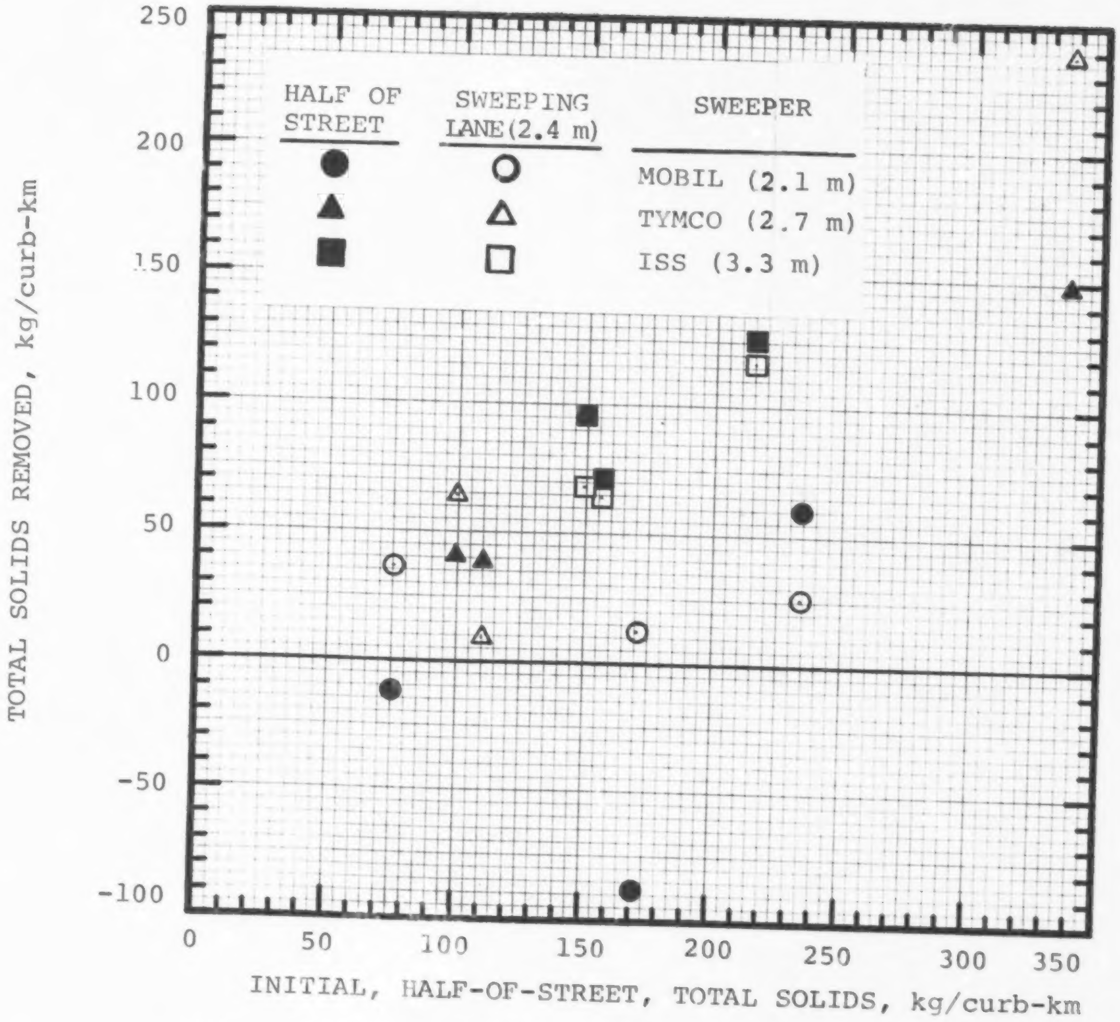


Figure 32. Comparison of total solids removed at SE 30th St.

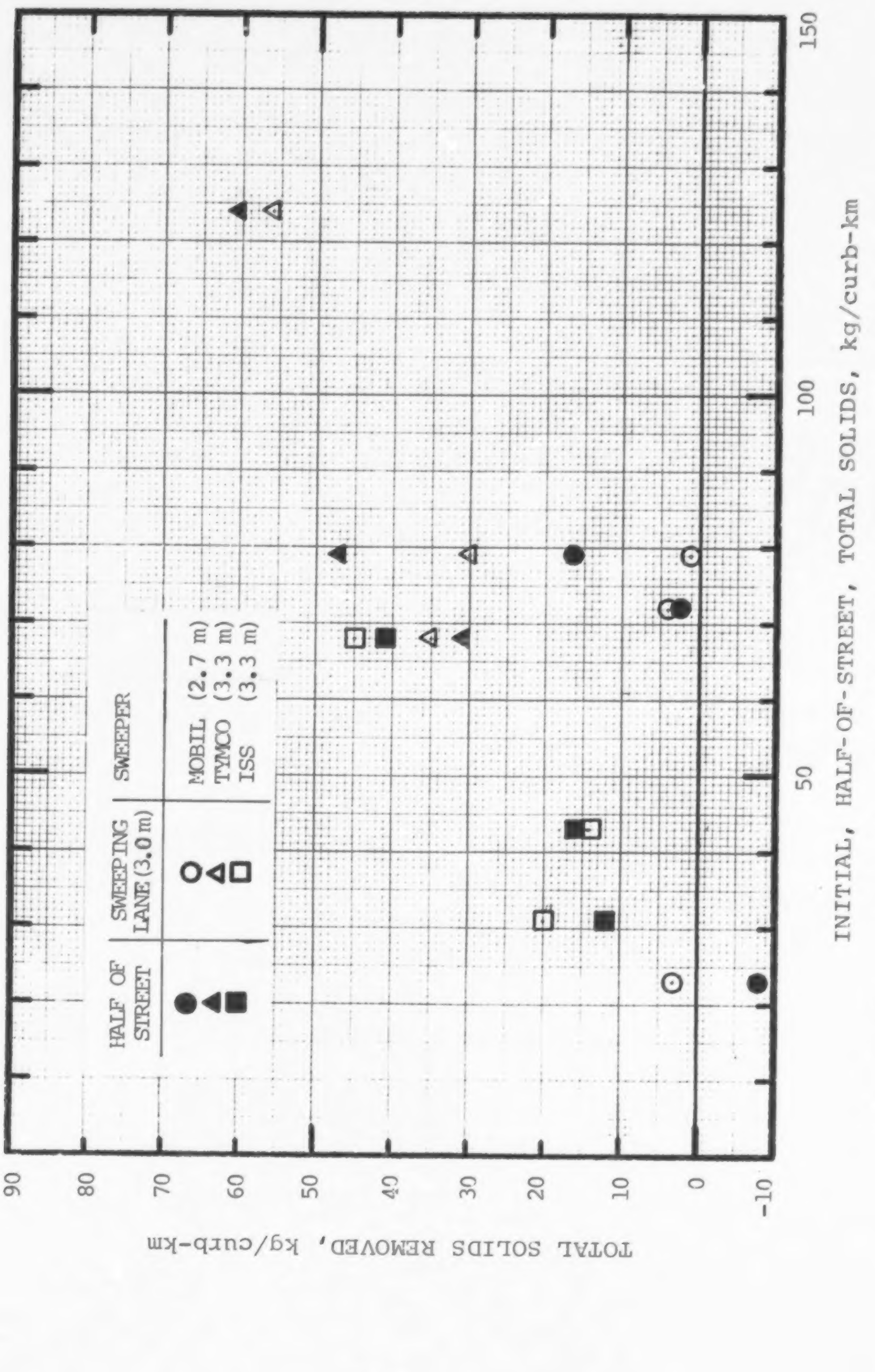


Figure 33 . Comparison of total solids removed at Surrey Downs.

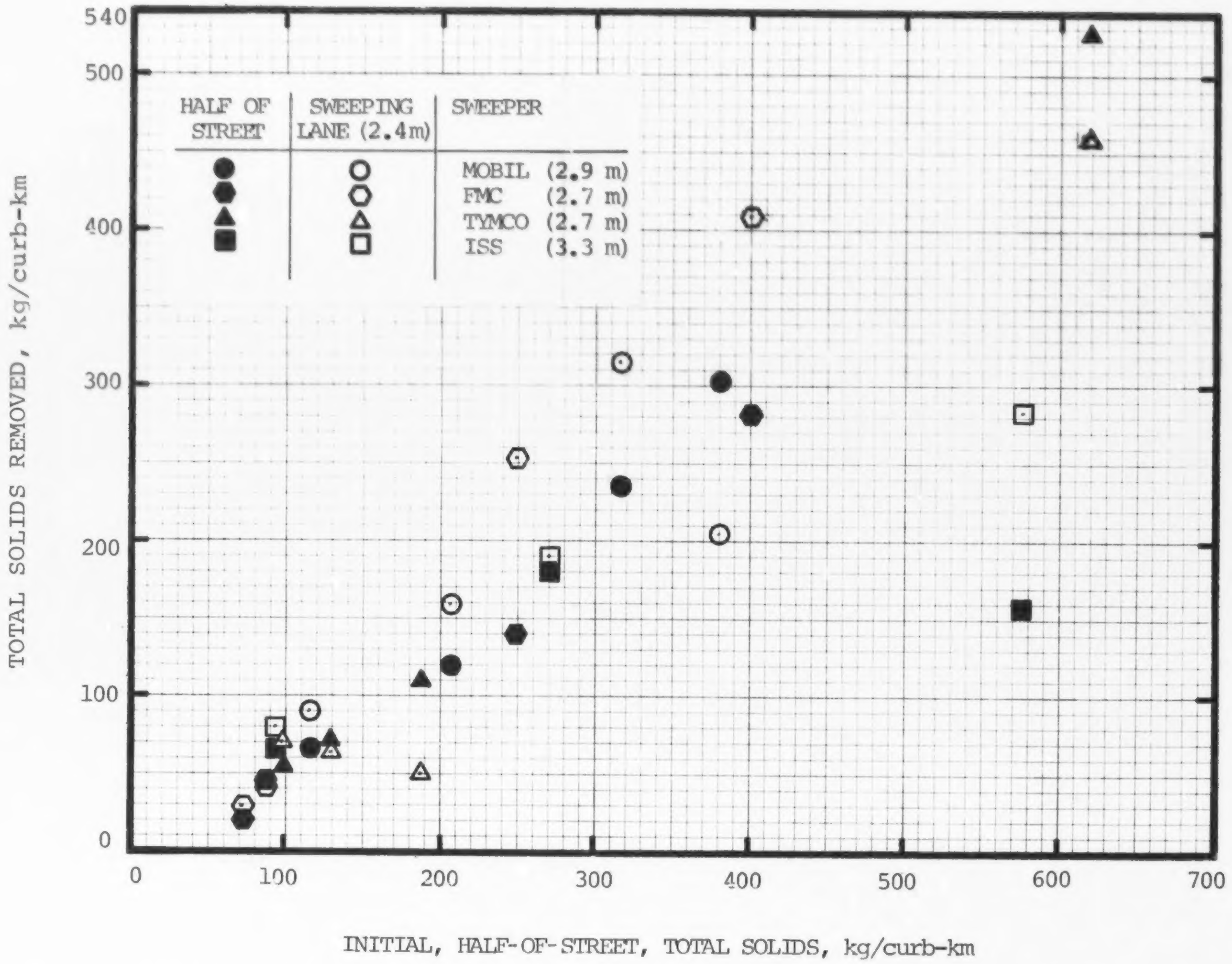


Figure 34. Comparison of total solids removed at Mission Blvd.

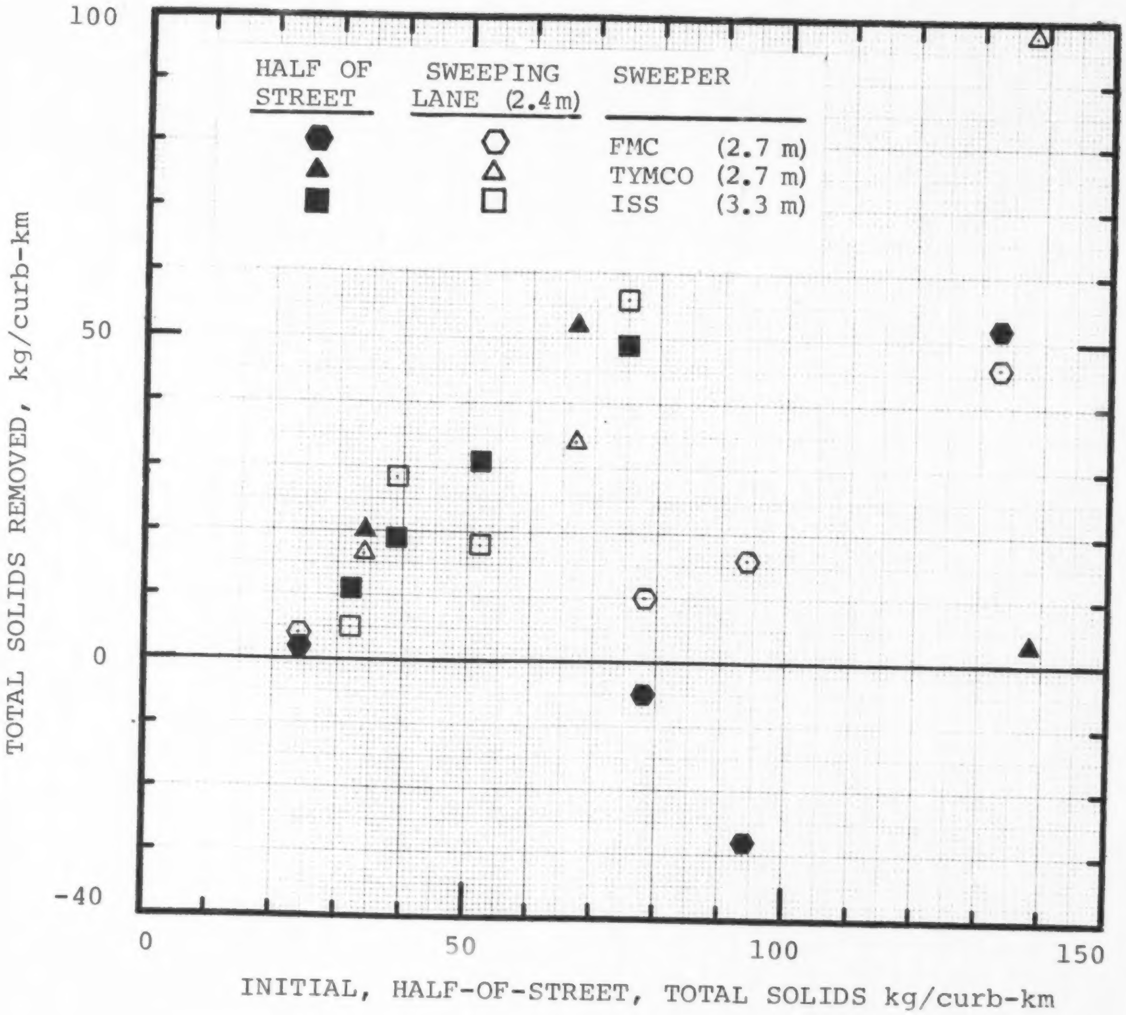


Figure 35. Comparison of total solids removed at Morena Blvd.

no evidence of solids being moved from the sweeper lane to the unswept portion of the street.

Since the sweeping lane samples provide a more accurate measure of sweeper performance (than half-of-street samples), and there is no evidence of solids movement to the unswept portion of the street, the sweeping lane samples will be used to indicate street cleaning performance in the remainder of this report.

Solids Larger Than 2000 Microns

The sweeper performances for the solids larger than 2000 microns (2 mm) are displayed in Figures 36 through 39. At SE 30th St. and Mission Blvd., no clear differences are seen. At Surrey Downs and Morena Blvd., the broom sweepers have the worst performances for removing particles larger than 2000 microns. The Surrey Downs results also clearly show that the ISS performance curve is the best and has a slope of nearly zero.

Solids From 500 to 2000 Microns

The abilities of the sweepers to remove the solids between 500 and 2000 microns are shown in Figures 40 through 43. At all 4 test areas, a broom sweeper showed the worst performance. Of these figures, only the figure for Surrey Downs (Figure 41) exhibits clear differences between the ISS and the Tymco sweepers. The ISS has a better performance curve which has a slope of 0.1. The Tymco sweeper curve has a slope of 0.5.

Solids From 63 to 500 Microns

The sweeper performances for solids between 63 and 500 microns in size are displayed in Figures 44 through 47. At all test areas except Mission Blvd., the sweepers have curves that are similar to the ones for total solids (Figures 24 to 27). The broom sweepers leave the highest residuals, and the slopes of their curves are about 1. The curves of the Tymco have slopes

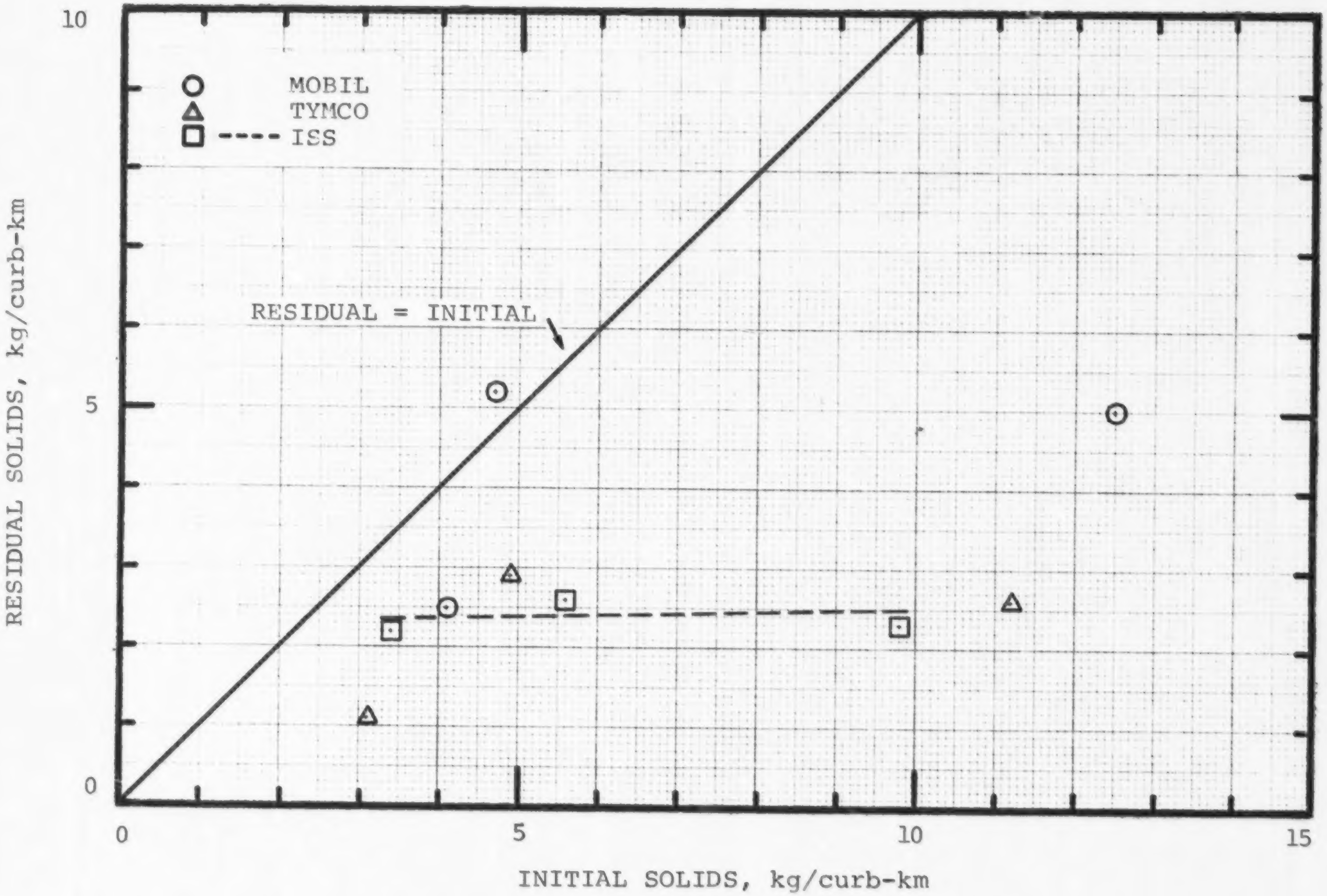


Figure 36. Larger than 2000 μm performance at SE 30th St. from sweeping lane samples.

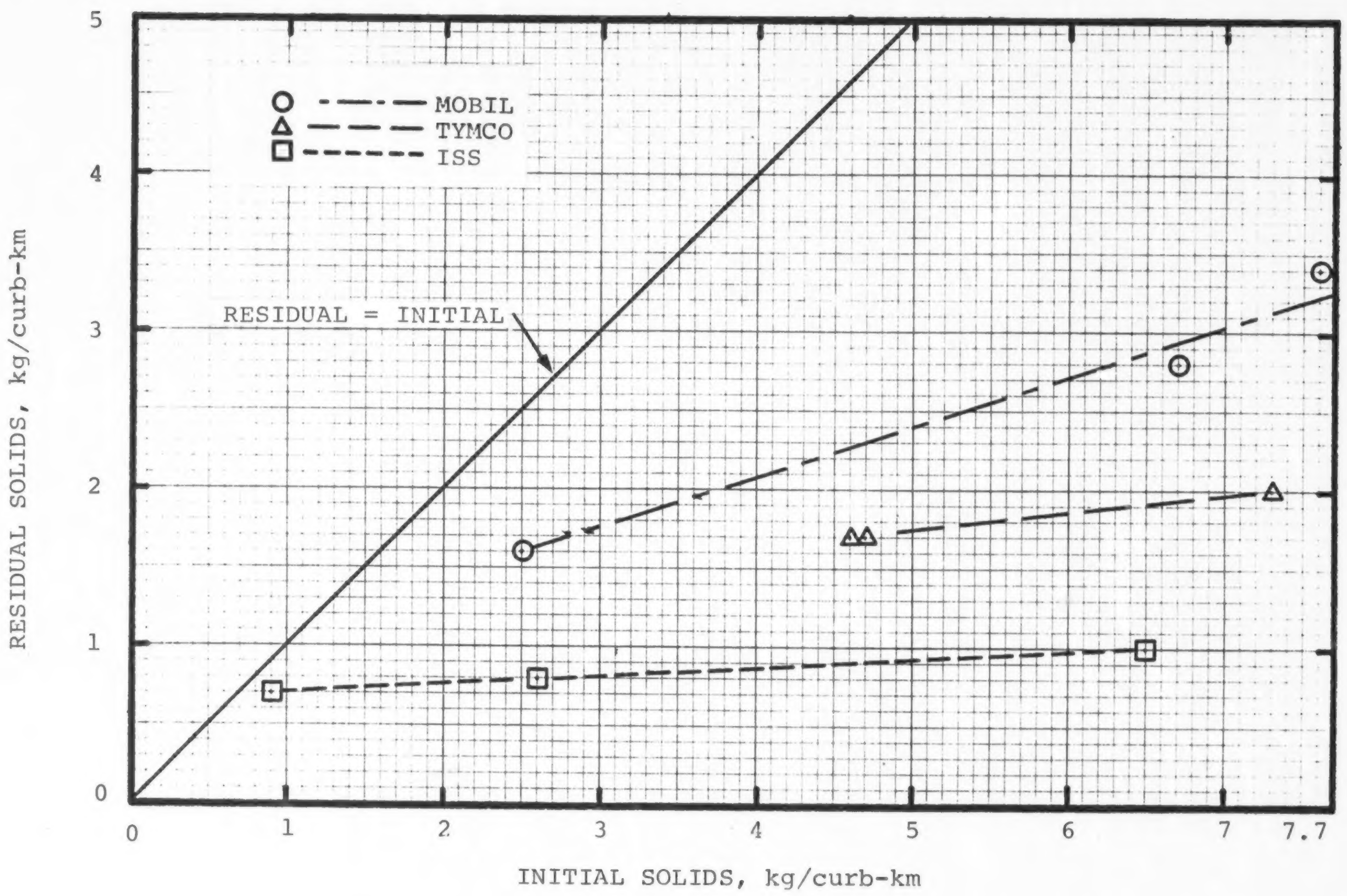


Figure 37. Larger than 2000 µm performance at Surrey Downs from sweeping lane samples.

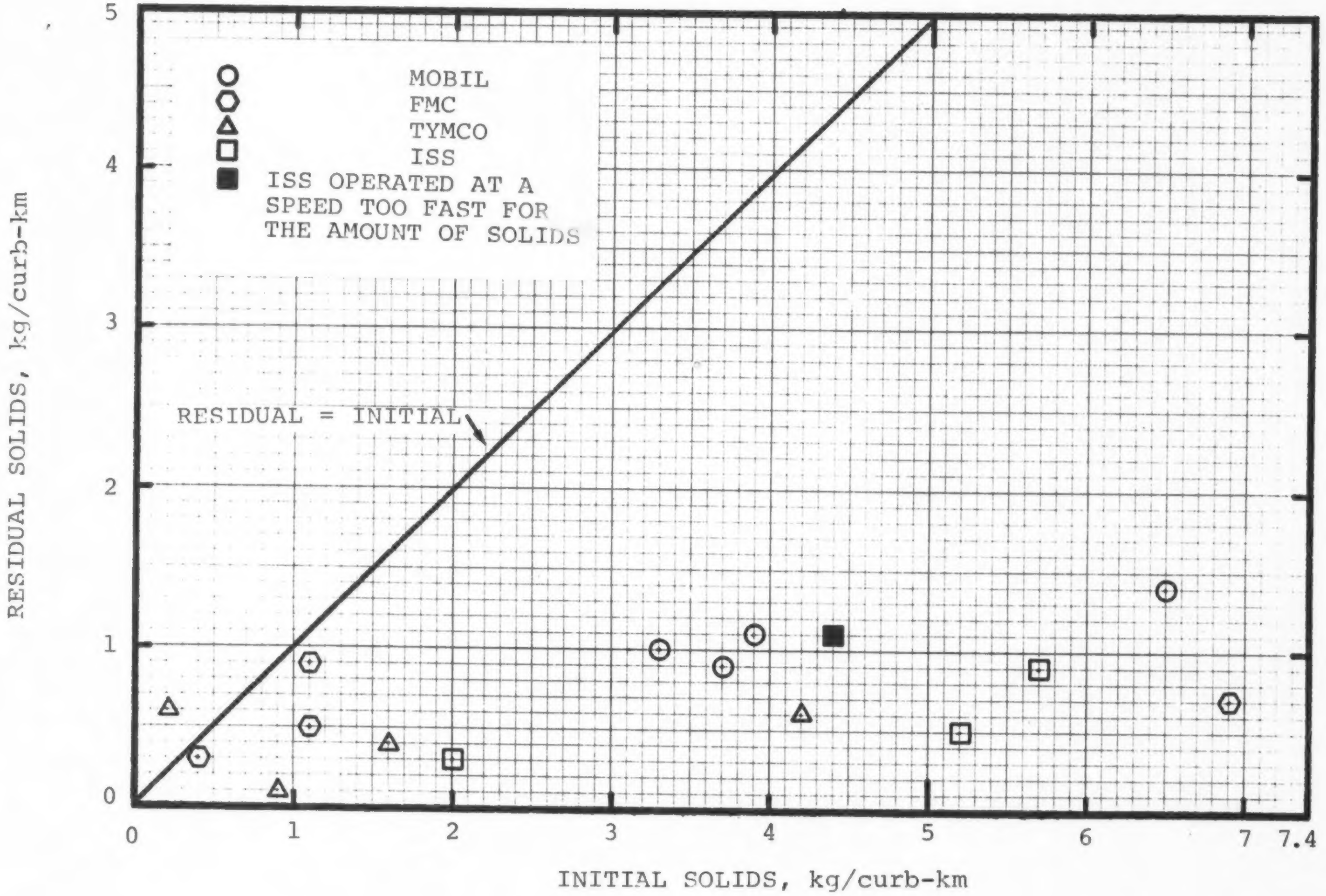


Figure 38. Larger than 2000 μm performance at Mission Blvd. from sweeping lane samples.

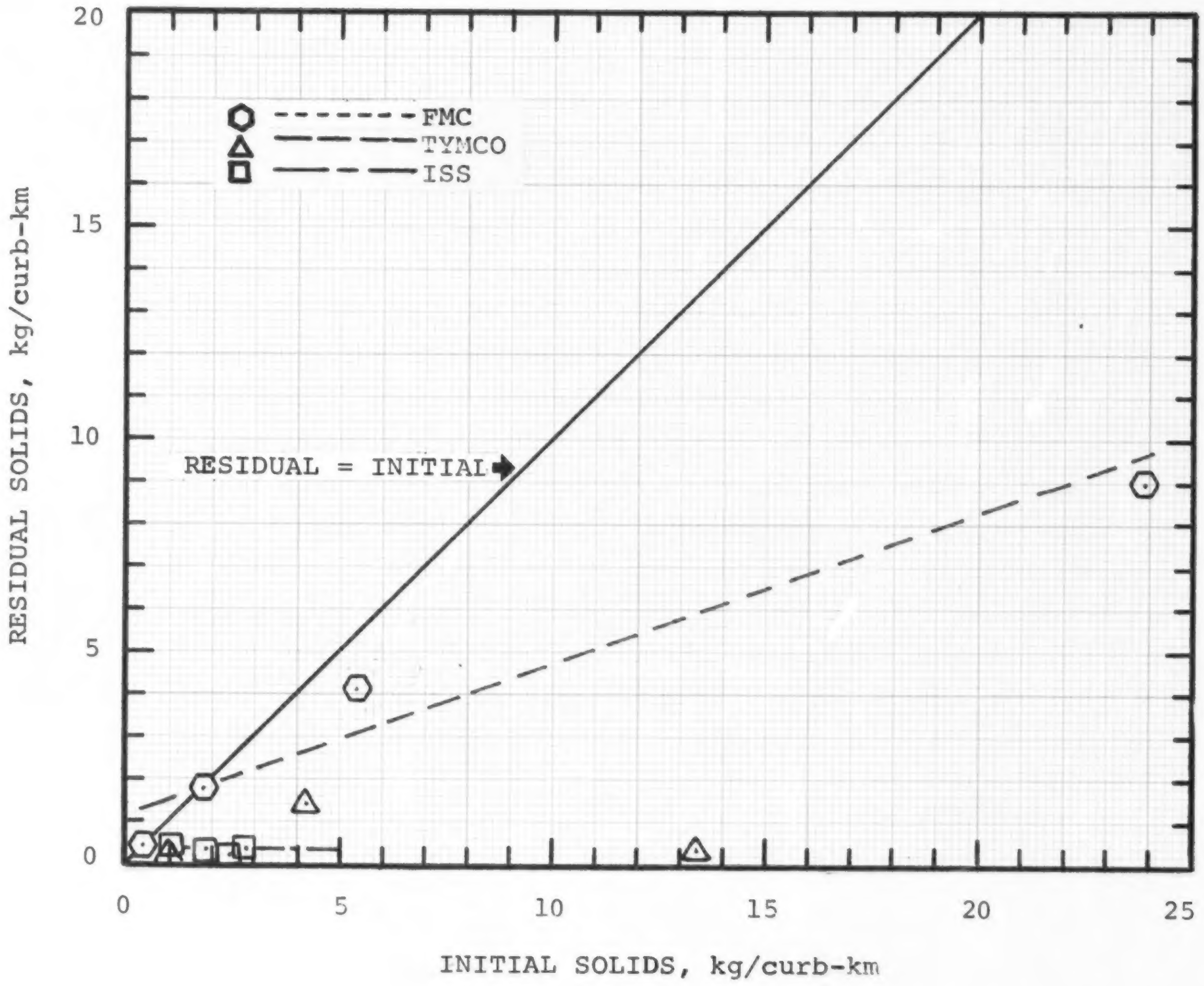


Figure 39. Larger than 2000 μm performance at Morena Blvd. from sweeping lane samples.

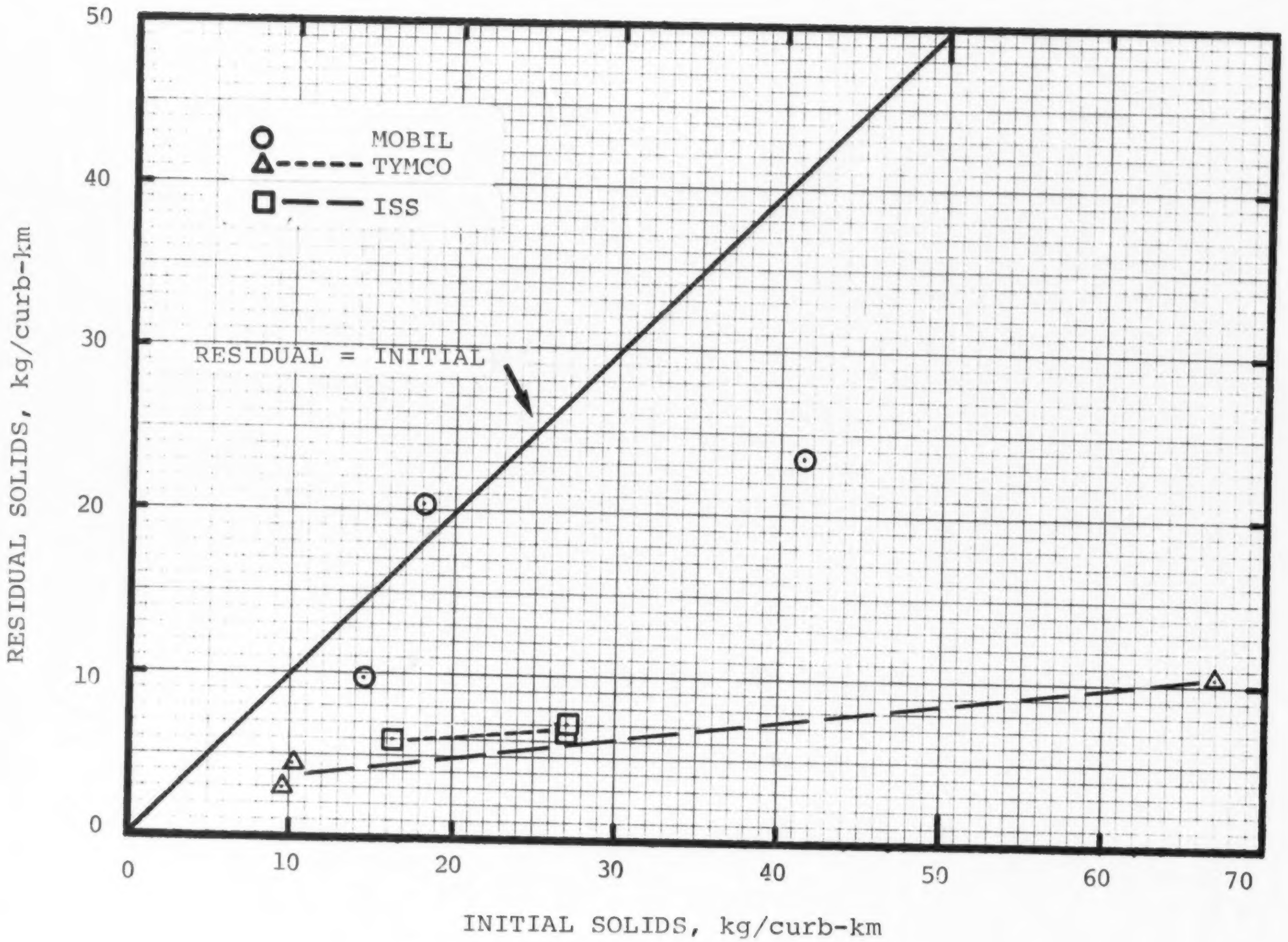


Figure 40. 500 to 2000 μm performance at SE 30th Street from sweeping lane samples.

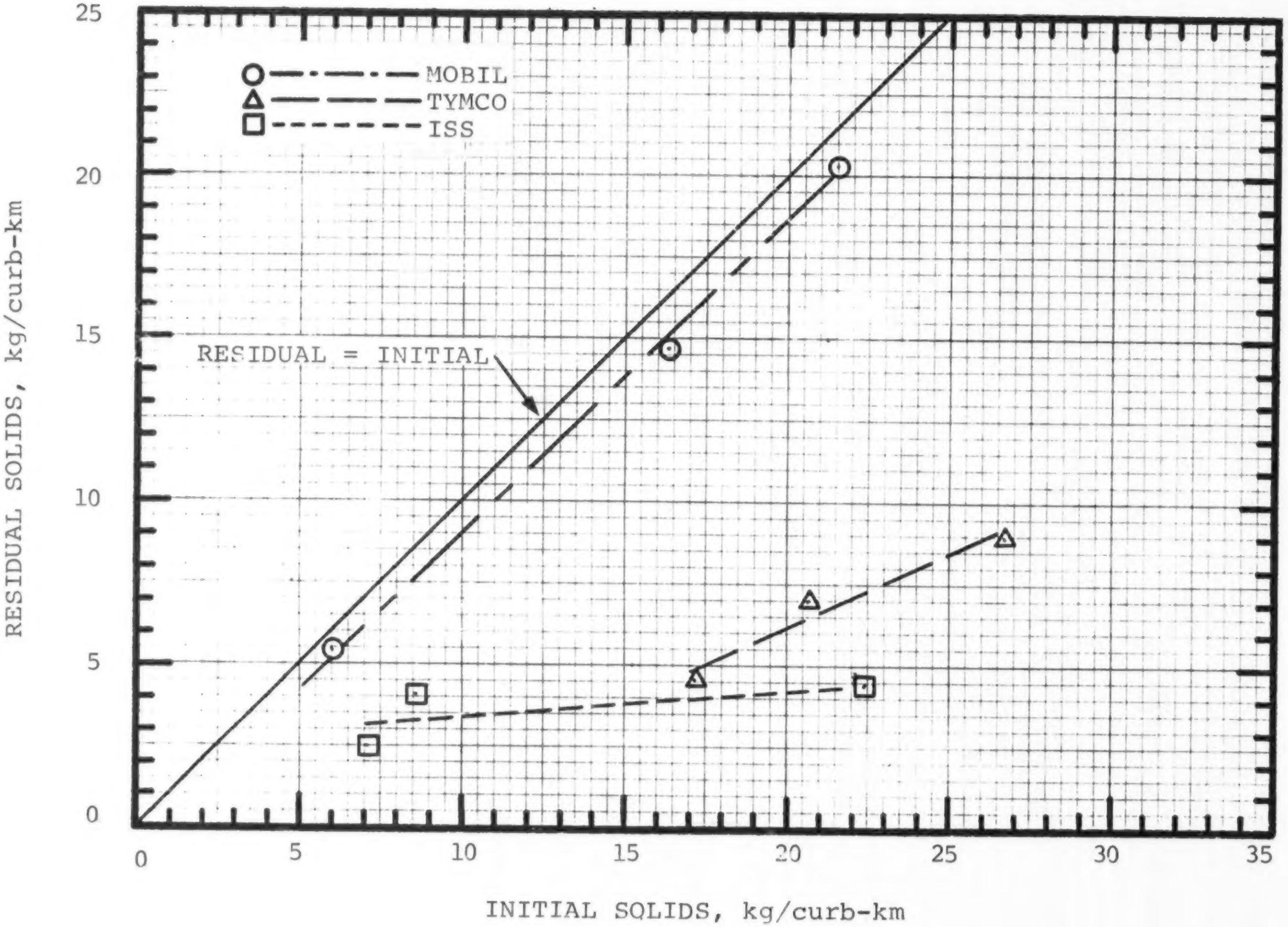


Figure 41. 500 to 2000 µm performance at Surrey Downs from sweeping lane samples

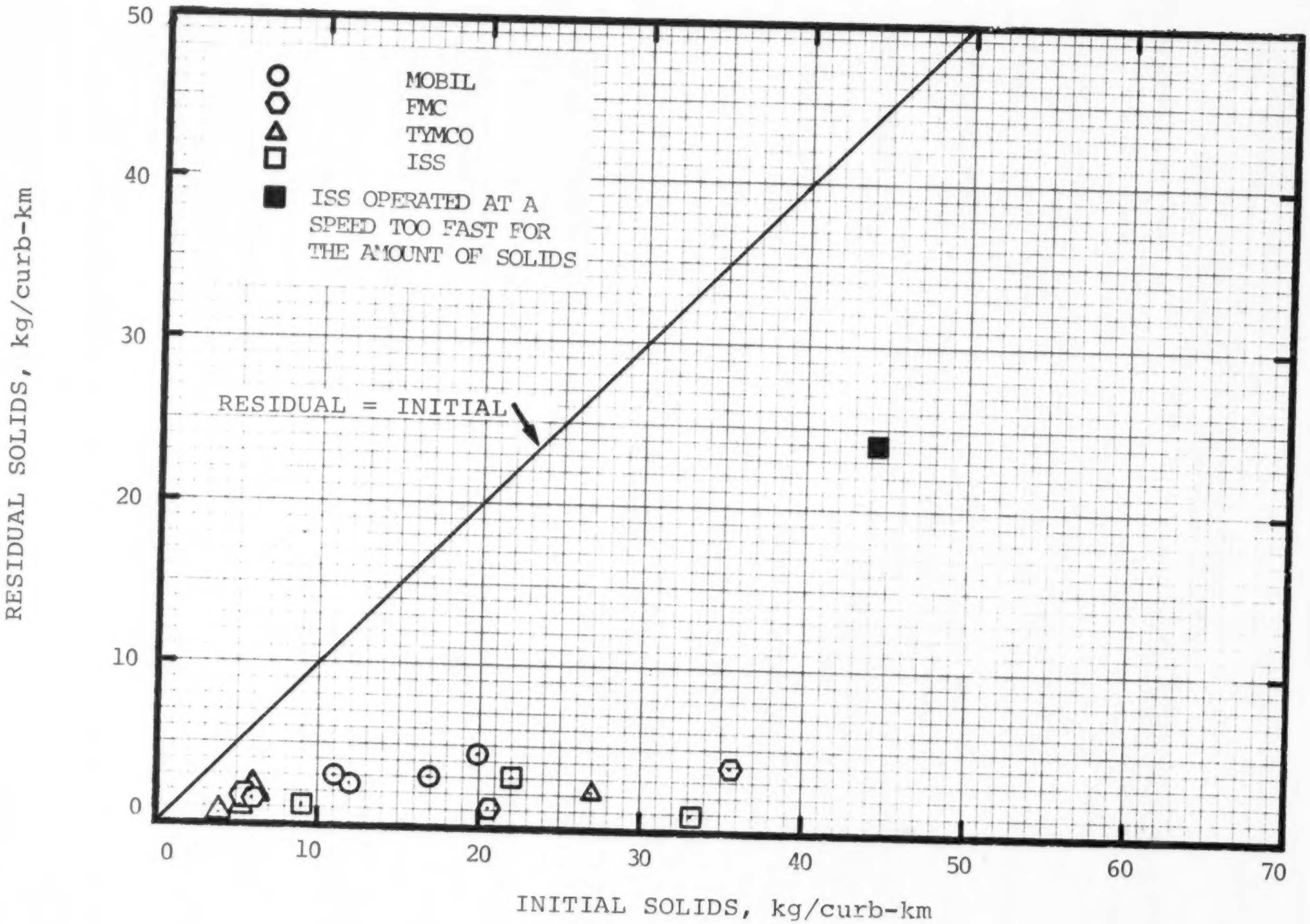


Figure 42. 500 to 2000 μm performance at Mission Blvd. from sweeping lane samples.

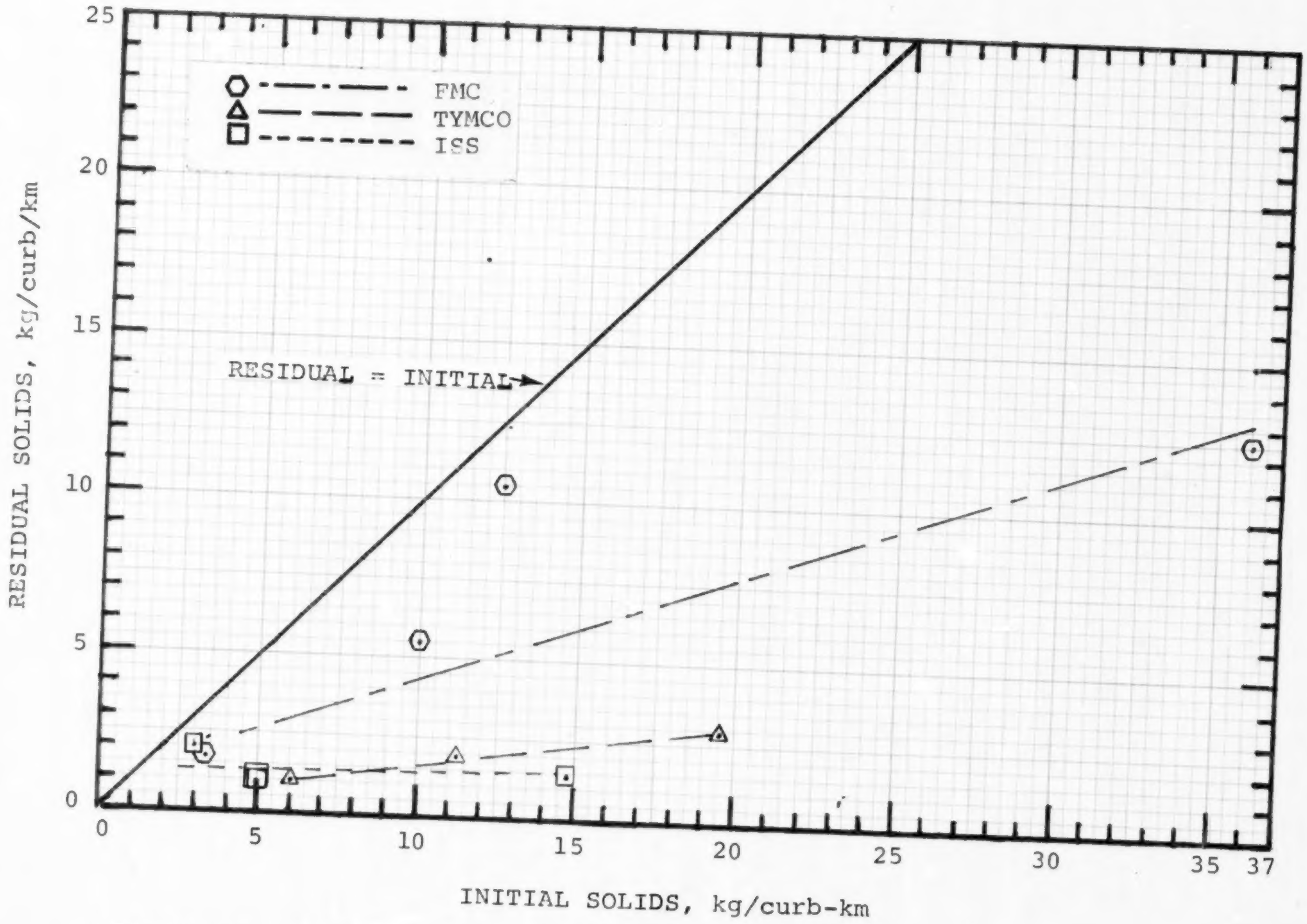


Figure 43. 500 to 2000 µm performance at Morena Blvd. from sweeping lane samples.

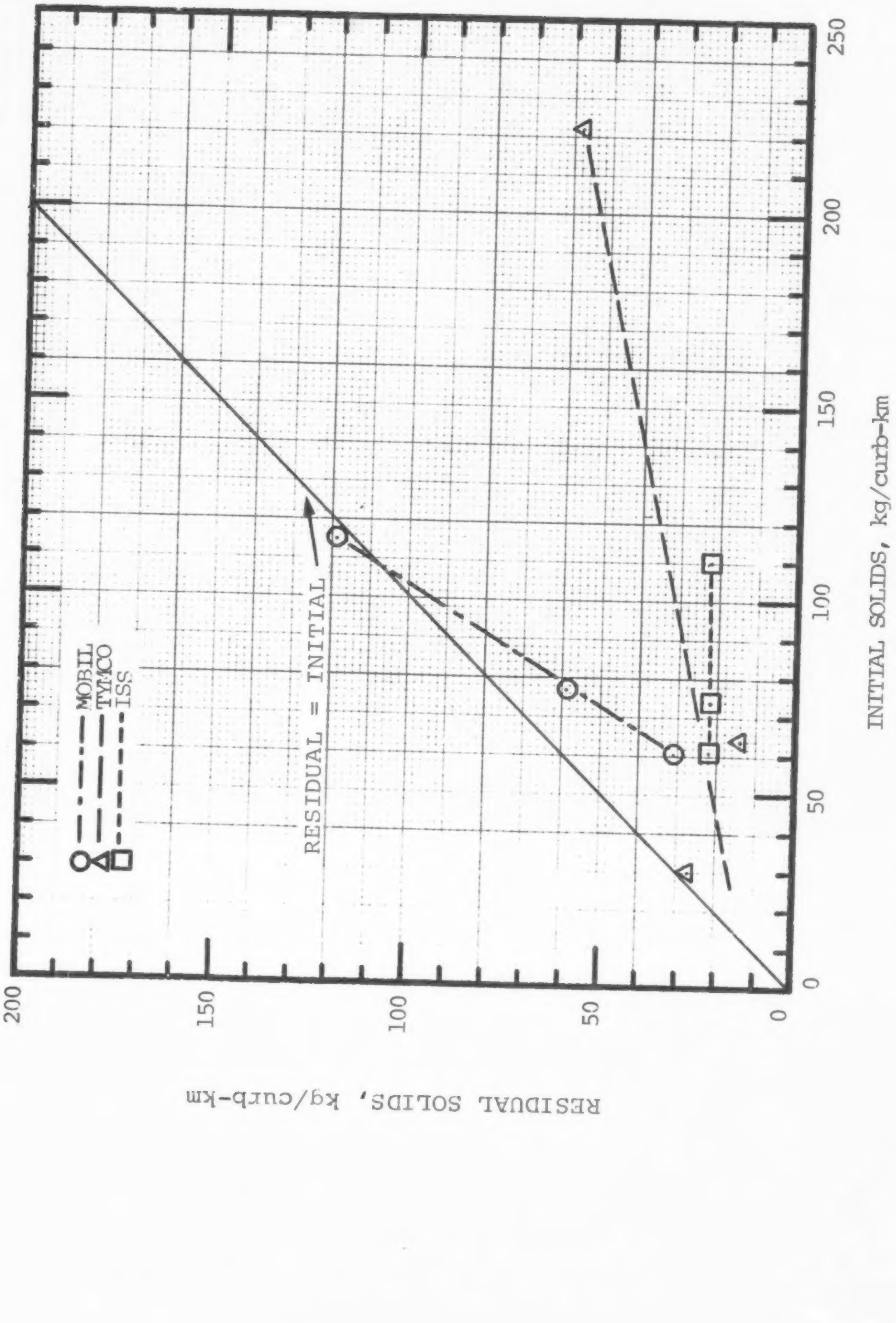


Figure 44. 63 to 500 µm performance at SE 30th St. from sweeping lane samples.

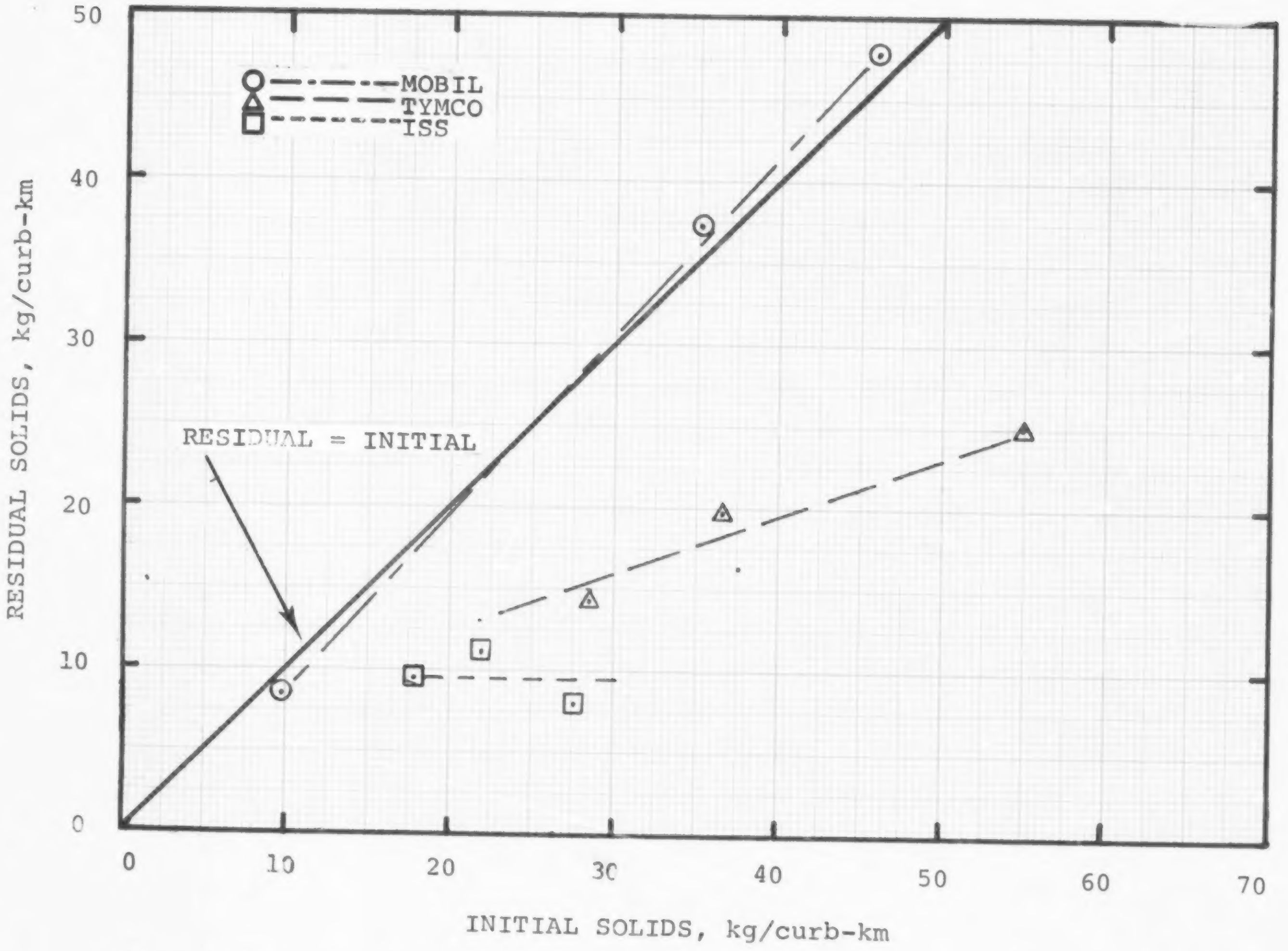


Figure 45. 63 to 500 µm performance at Surrey Downs from sweeping lane samples.

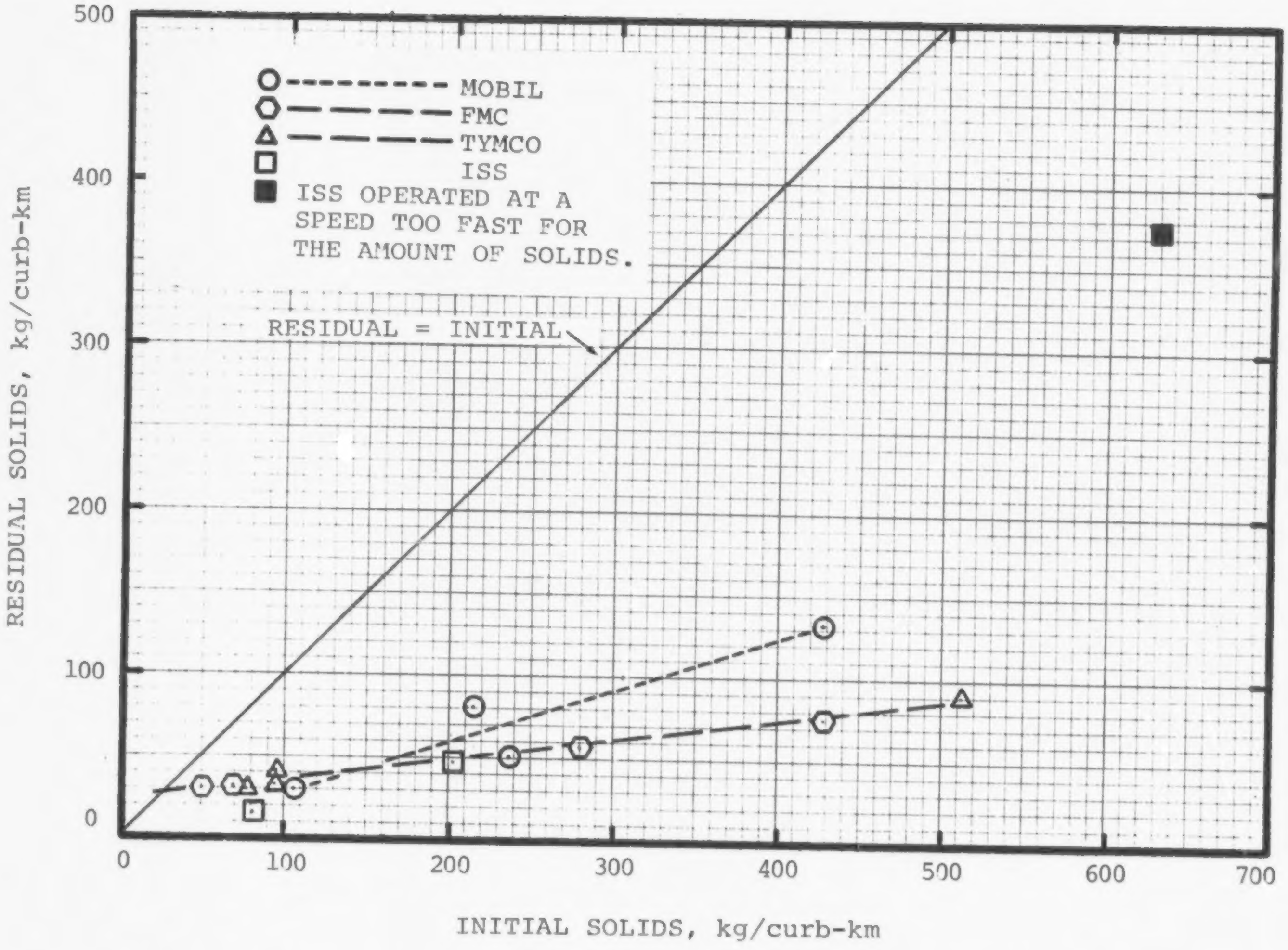


Figure 46. 63 to 500 μm performance at Mission Blvd. from sweeping lane samples.

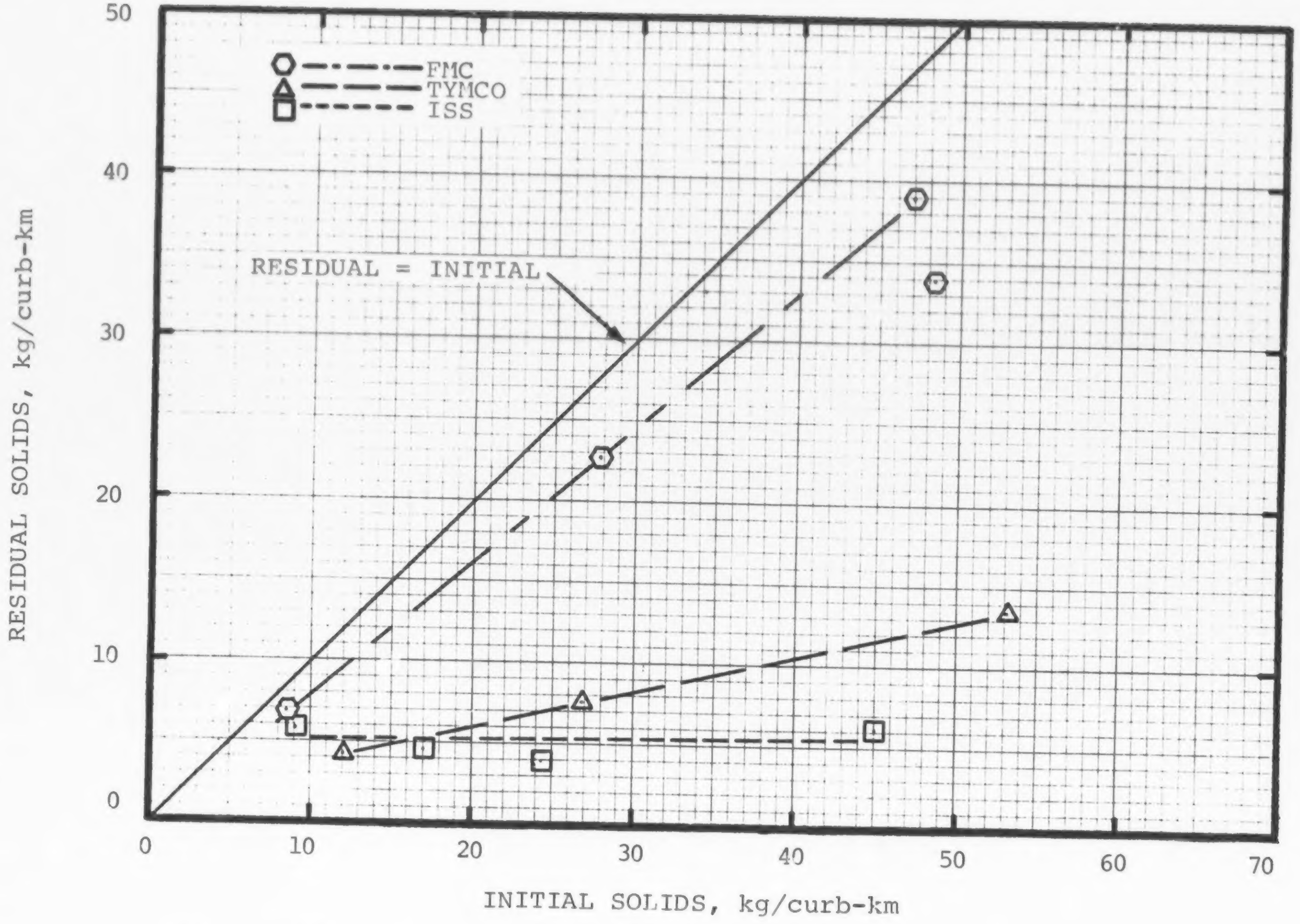


Figure 47. 63 to 500 μm performance at Morena Blvd. from sweeping lane samples.

from 0.2 to 0.5. The ISS has the best performance curves, with slopes of approximately zero. At Mission Blvd., where the initial loadings are by far the highest of the 4 test areas, the Mobil has the worst performance, while there is no significant differences among the other 3 sweeper types.

Solids Smaller Than 63 Microns

The performances for particles smaller than 63 microns are shown in Figures 48 through 51. The particles smaller than 63 microns represent the portion of the street solids with the highest probability of becoming airborne. The actual size range that could become airborne depends on the air velocities and the terminal settling velocities of the particles.

The test data for this portion of the solids are erratic with only the Surrey Downs and Mission Blvd. data exhibiting definite relationships. At Surrey Downs, the Mobil sweeper had the worst performance; and the ISS had the best performance, removing 43% of these solids. The Tymco removed 0 to 30% of the solids.

At Mission Blvd., the FMC had the worst performance curve; and the ISS the best, removing 15 to 75% of the solids smaller than 63 microns.

Solids Smaller Than 10 Microns-Aerodynamic

The results for particle diameters smaller than 10 microns-aerodynamic, i.e. respirable particles, are shown in Figures 52 through 55. These data points are also erratic, but at SE 30th St. and Surrey Downs, several relationships are indicated. The Tymco and the ISS have comparable performances. The Mobil sweeper has the lowest residuals for initial concentrations less than about 0.18 kg/curb-km (0.64 lb/curb-mi), and the highest

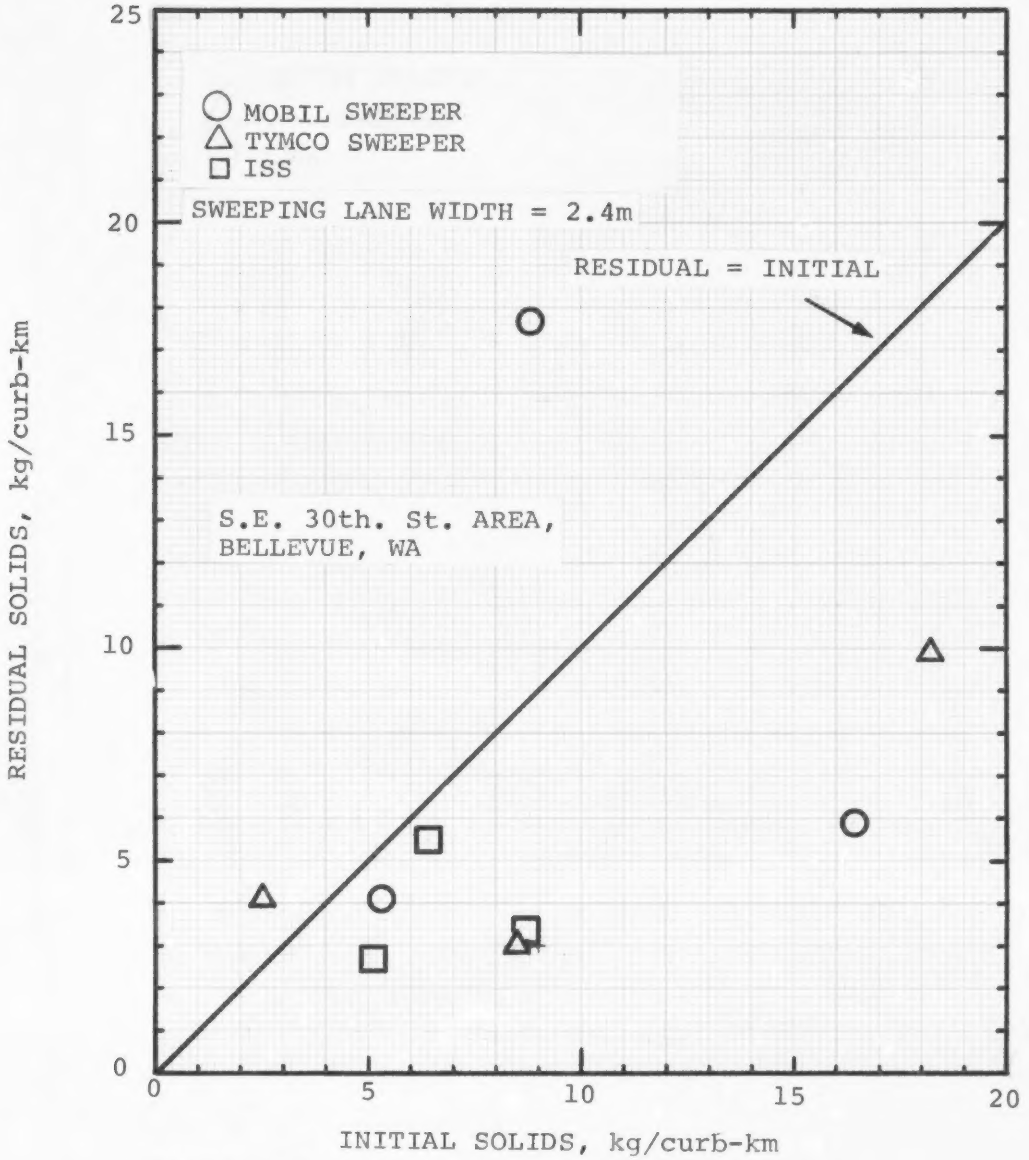


Figure 48. Smaller than 63µm performance at SE 30th St. from sweeping lane samples.

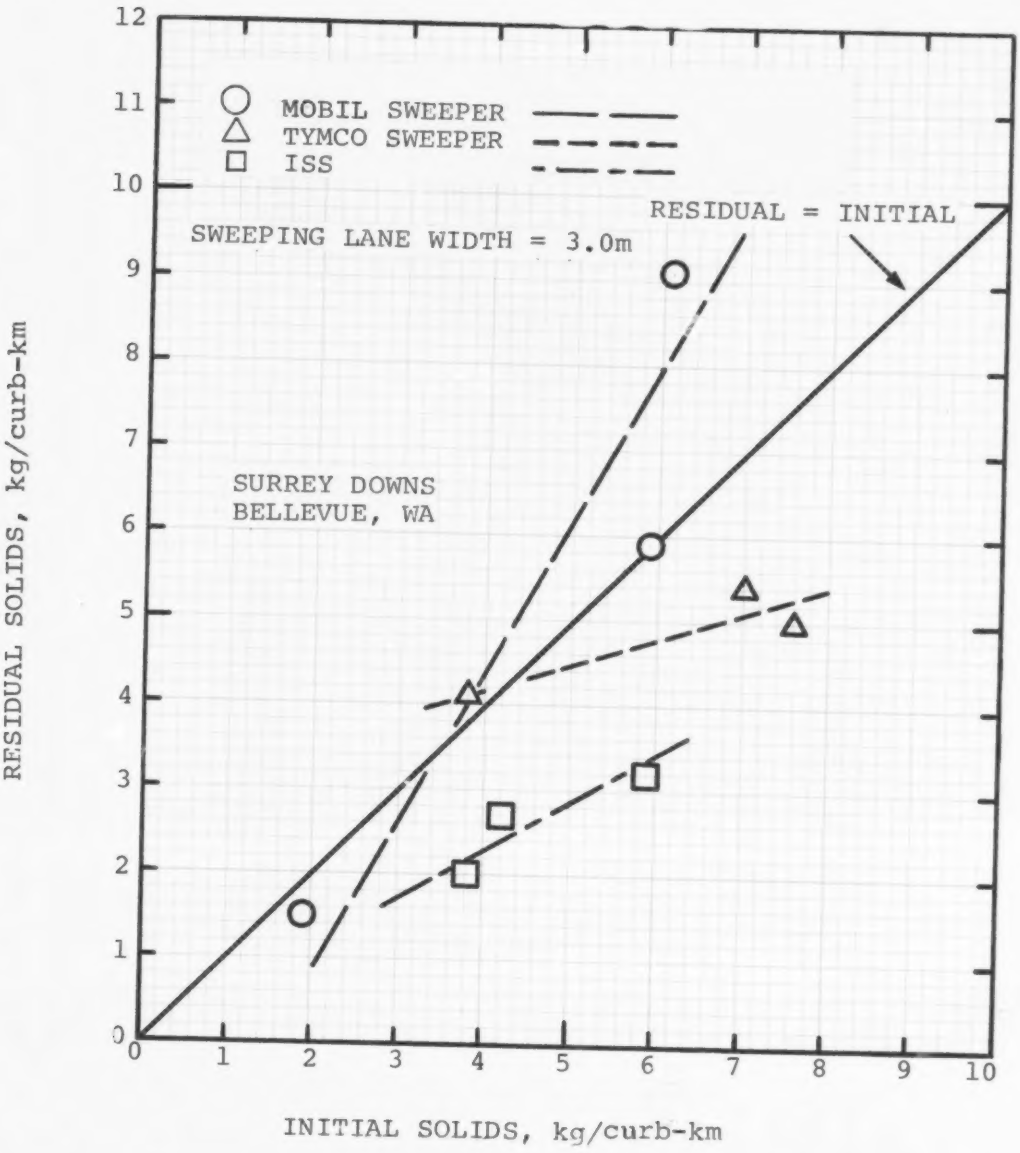


Figure 49. Smaller than 63μm performance at Surrey Downs for sweeping lane samples.

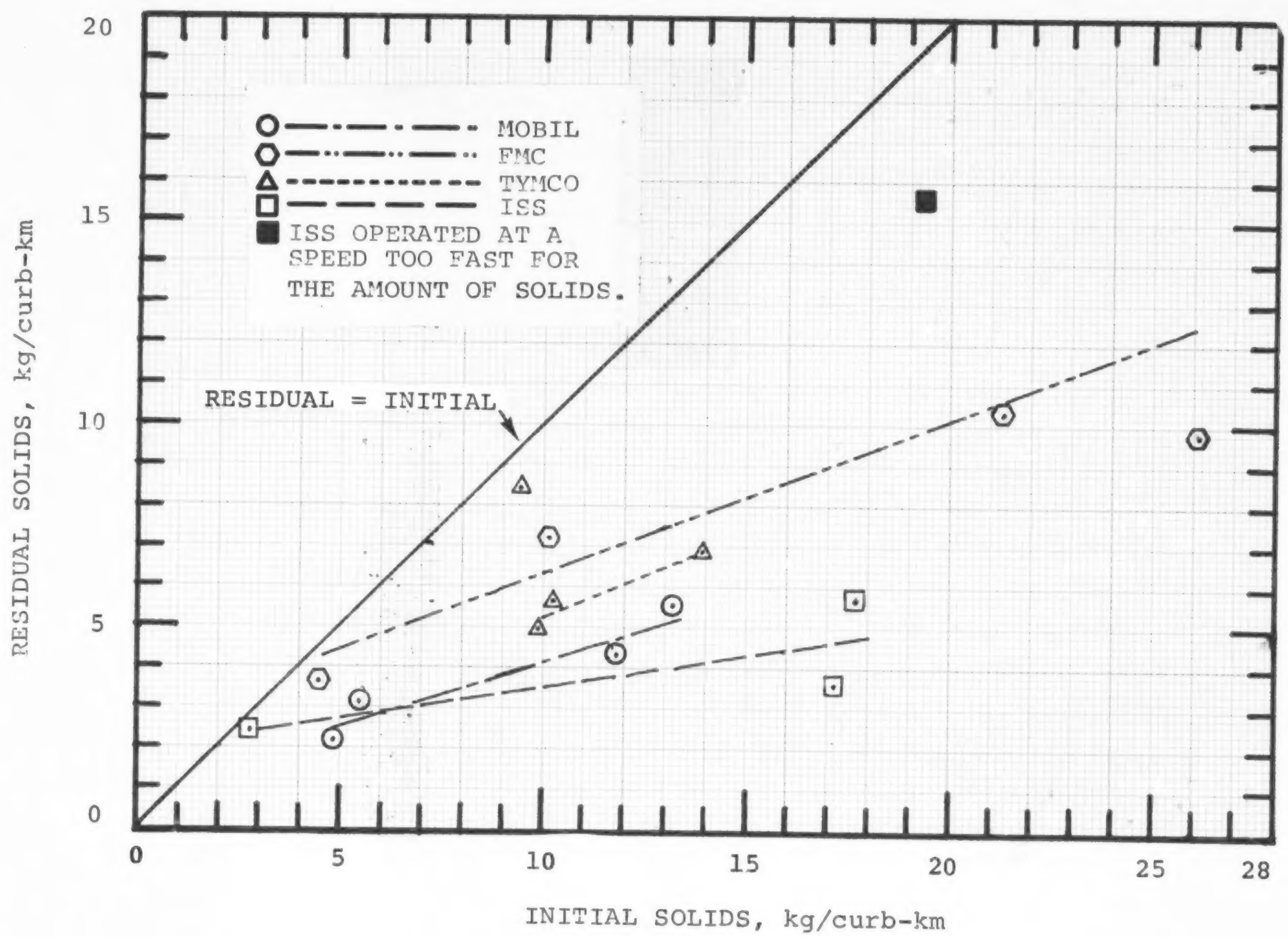


Figure 50. Smaller than 63 μm performance at Mission Blvd. from sweeping lane samples.

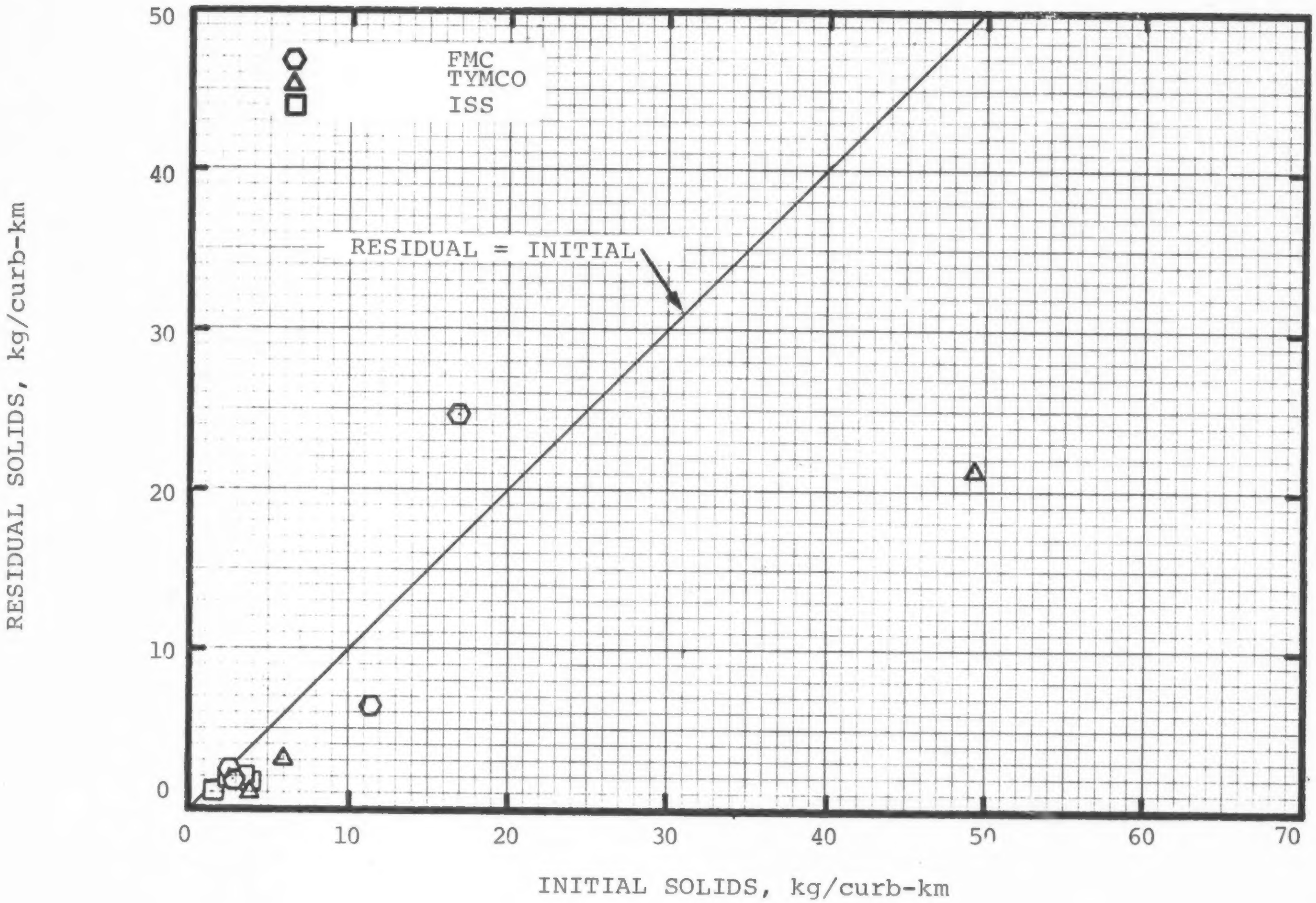


Figure 51. Smaller than 63 µm performance at Morena Blvd. from sweeping lane samples.

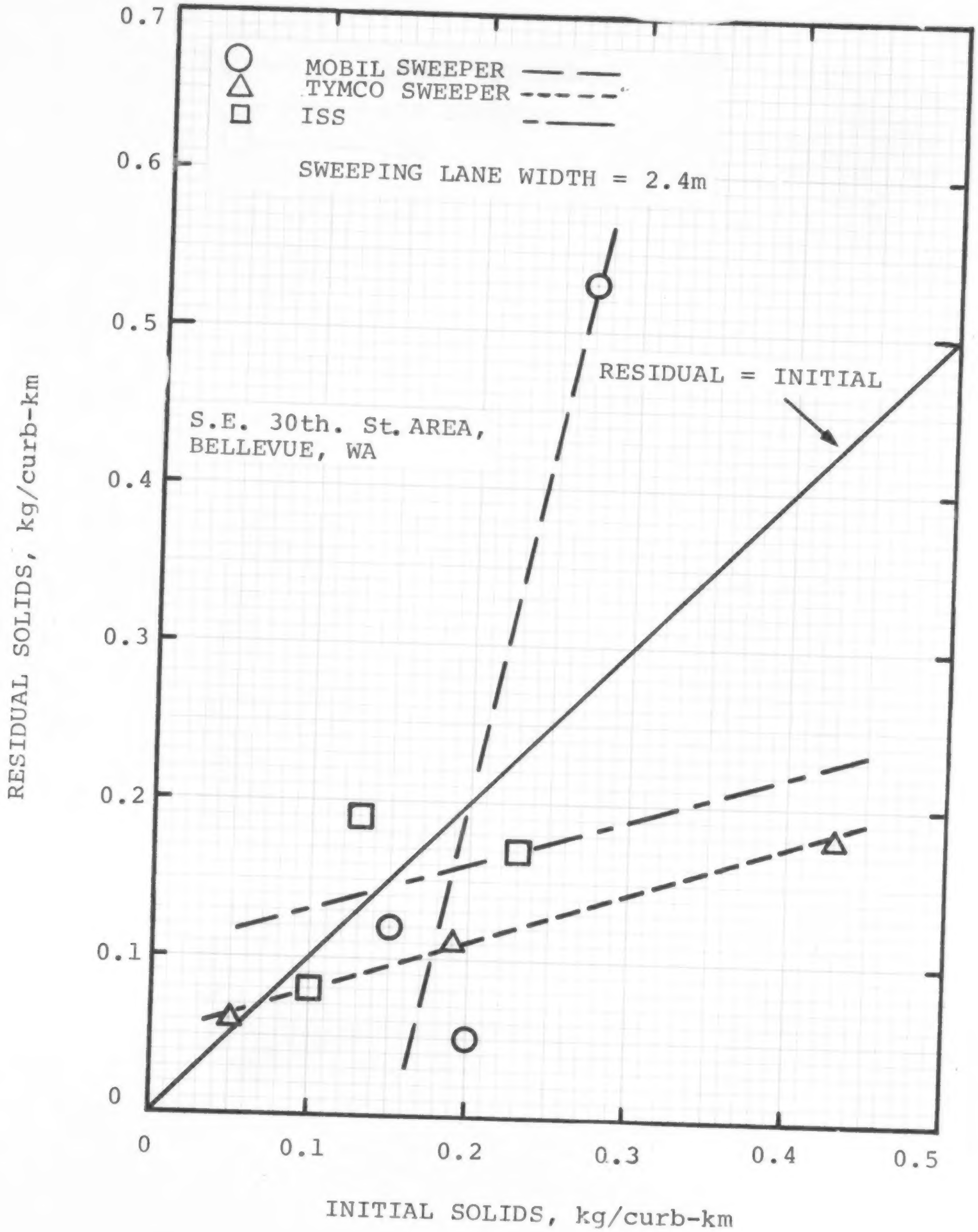


Figure 52. Smaller than 10μmA performance at SE 30th St. from sweeping lane samples.

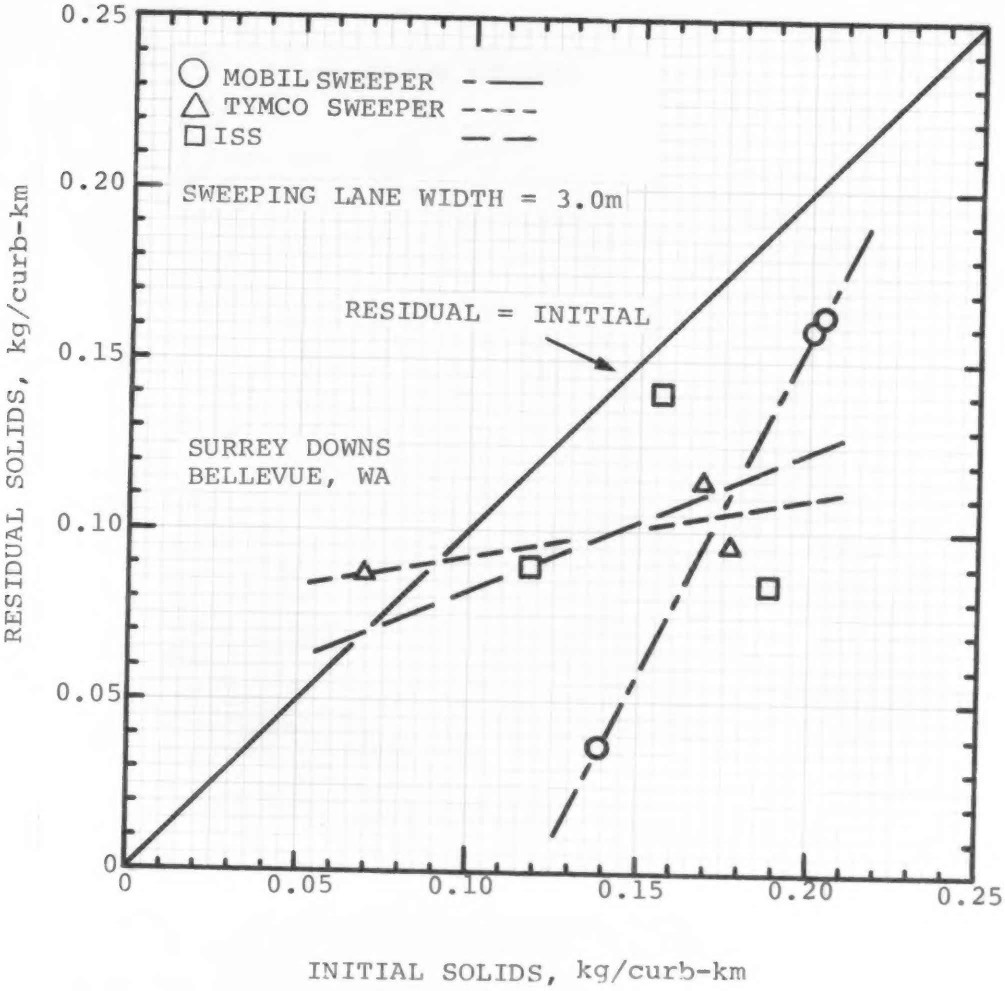


Figure 53. Smaller than 10μmA performance at Surrey Downs from sweeping lane samples.

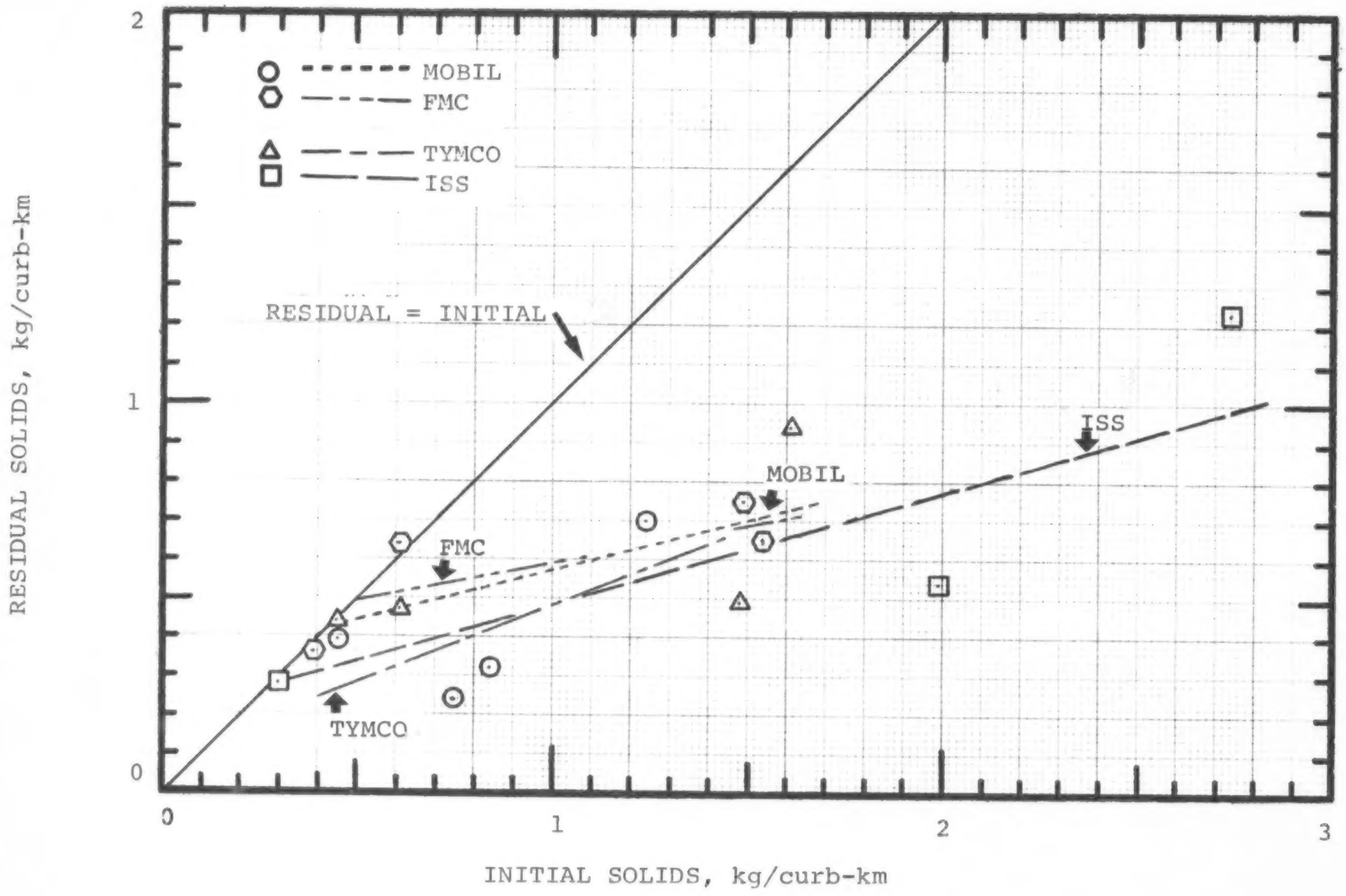


Figure 54. Smaller than 10 μmA performance at Mission Blvd. from sweeping lane samples.

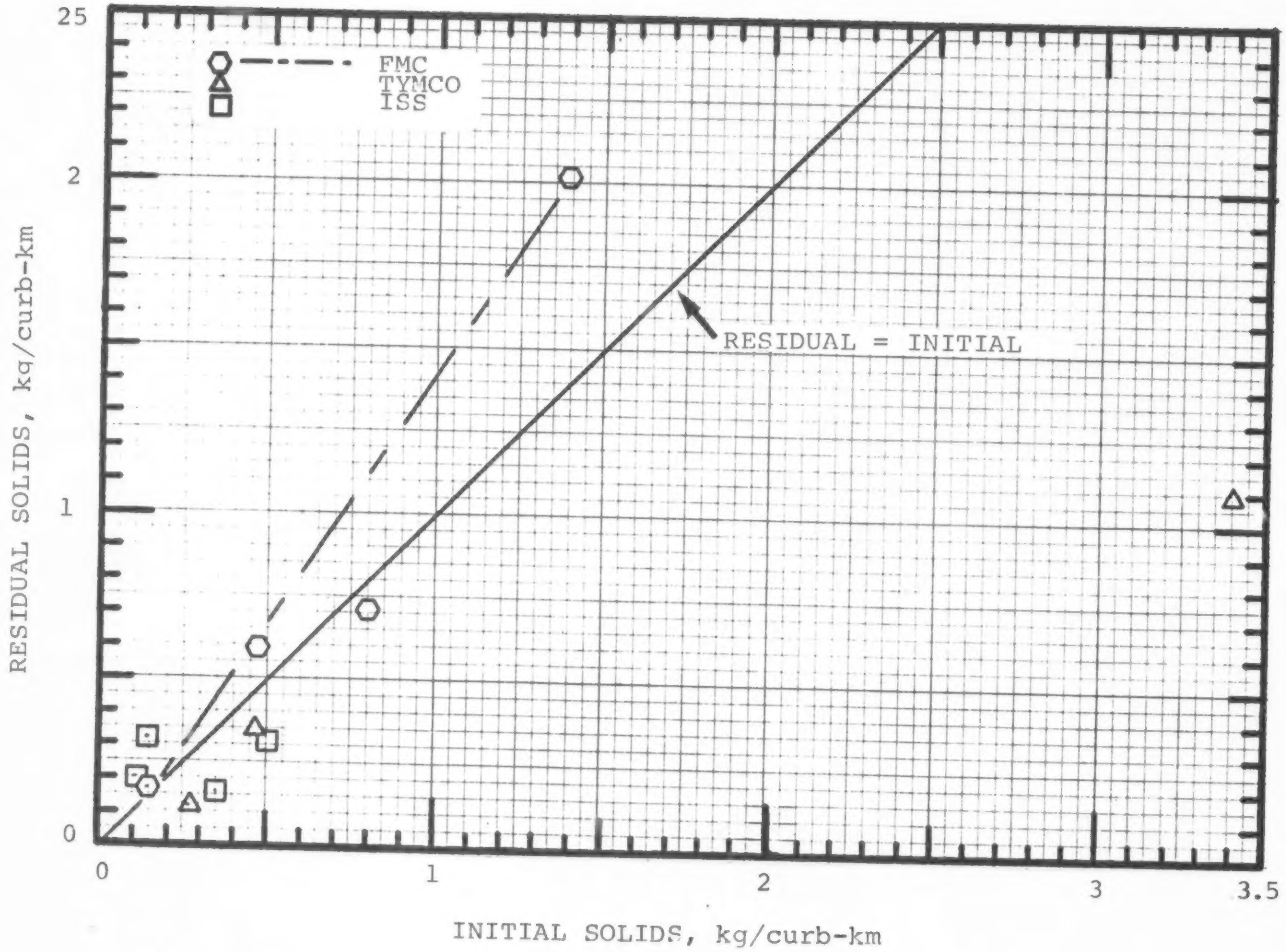


Figure 55. Smaller than 10 µmA performance at Morena Blvd. from sweeping lane samples.

residuals for initial concentrations greater than this. An accurate measure of sweeping performance for particles smaller than 10 µmA would need to include ambient air sampling adjacent to the swept street.

RELATIVE DUST DISPERSION EFFECTS OF ISS MODIFICATIONS

During sweeping some dust is dispersed by the gutter brooms. Since the same sweeper was used for both the Tymco tests and the ISS tests, a comparison of dust concentration was accomplished by sampling with total filters mounted at fixed positions on top of the sweeper's pickup head at its leading edge. The "outside filter" was at 15 cm (6 in.) and the "inside filter" was at 76 cm (30 in.) from the curbside end of the pickup head.

The dust concentrations measured by the total filters are plotted as a function of the initial sweeping lane solids smaller than 10 µmA in Figures 56 through 59. These data points are very scattered. Therefore, it can not be concluded whether the ISS disperses less dust than the Tymco. However, based on visual observations, the ISS did have a smaller dust plume.

ISS SCRUBBER EMISSIONS

ISS Scrubber Optimization Tests

The scrubber of the ISS was optimized by evaluating its performance as a function of the liquid-to-gas ratio. Venturi scrubber theory (Yung et al, 1977) predictes an optimum liquid-to-gas ratio of 2.0 l/m^3 (15 gal/1,000 ft^3) for the inlet particle size distribution measured under EPA Contract No. 68-02-3148. A lower liquid-to-gas ratio would further increase the collection efficiency of sub-micron particles, while decreasing the collection efficiency of the larger particles. The collection efficiency for sub-micron particles increases as the

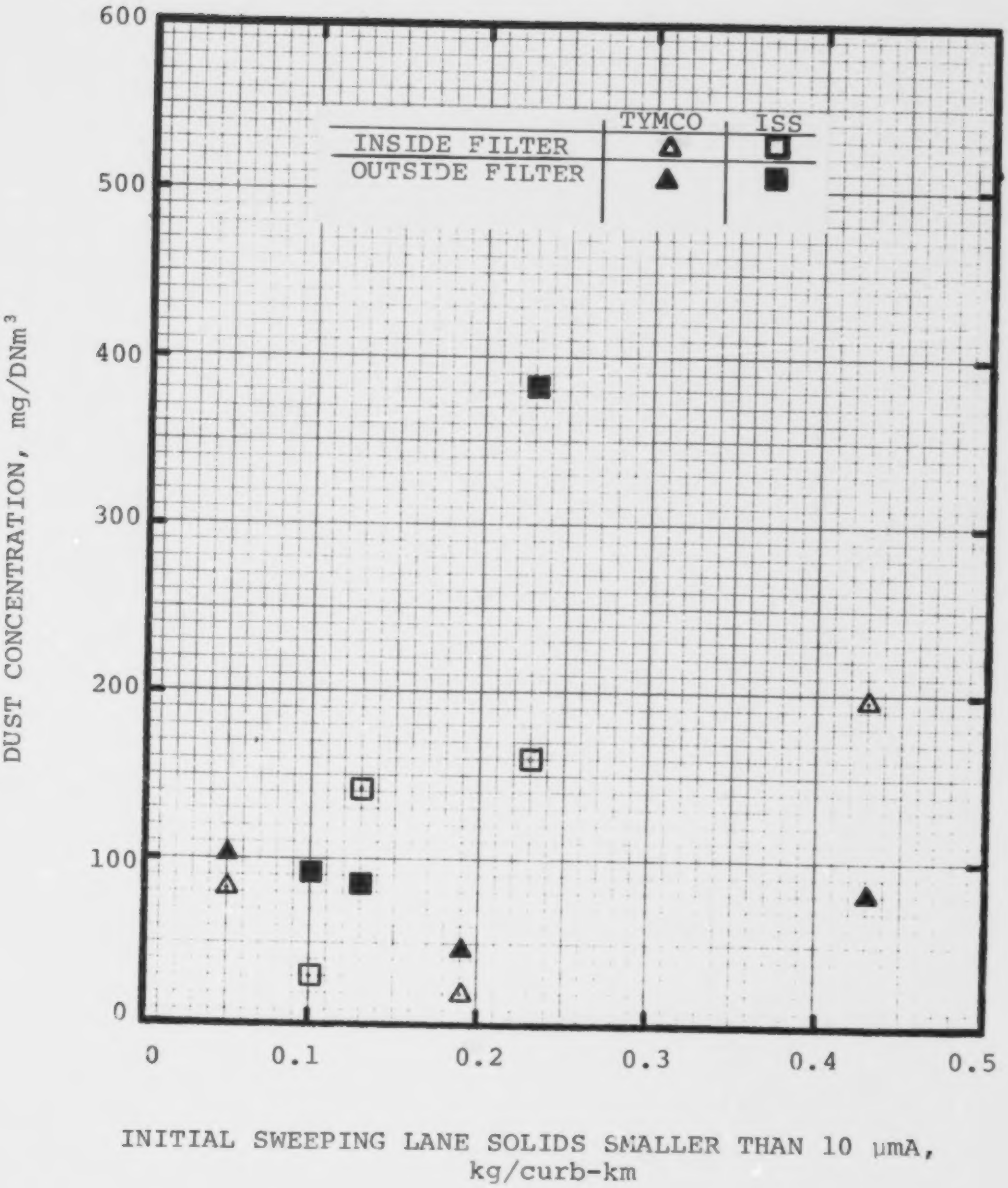


Figure 56. Relative dust dispersions of Tymco and ISS at SE 30th St.

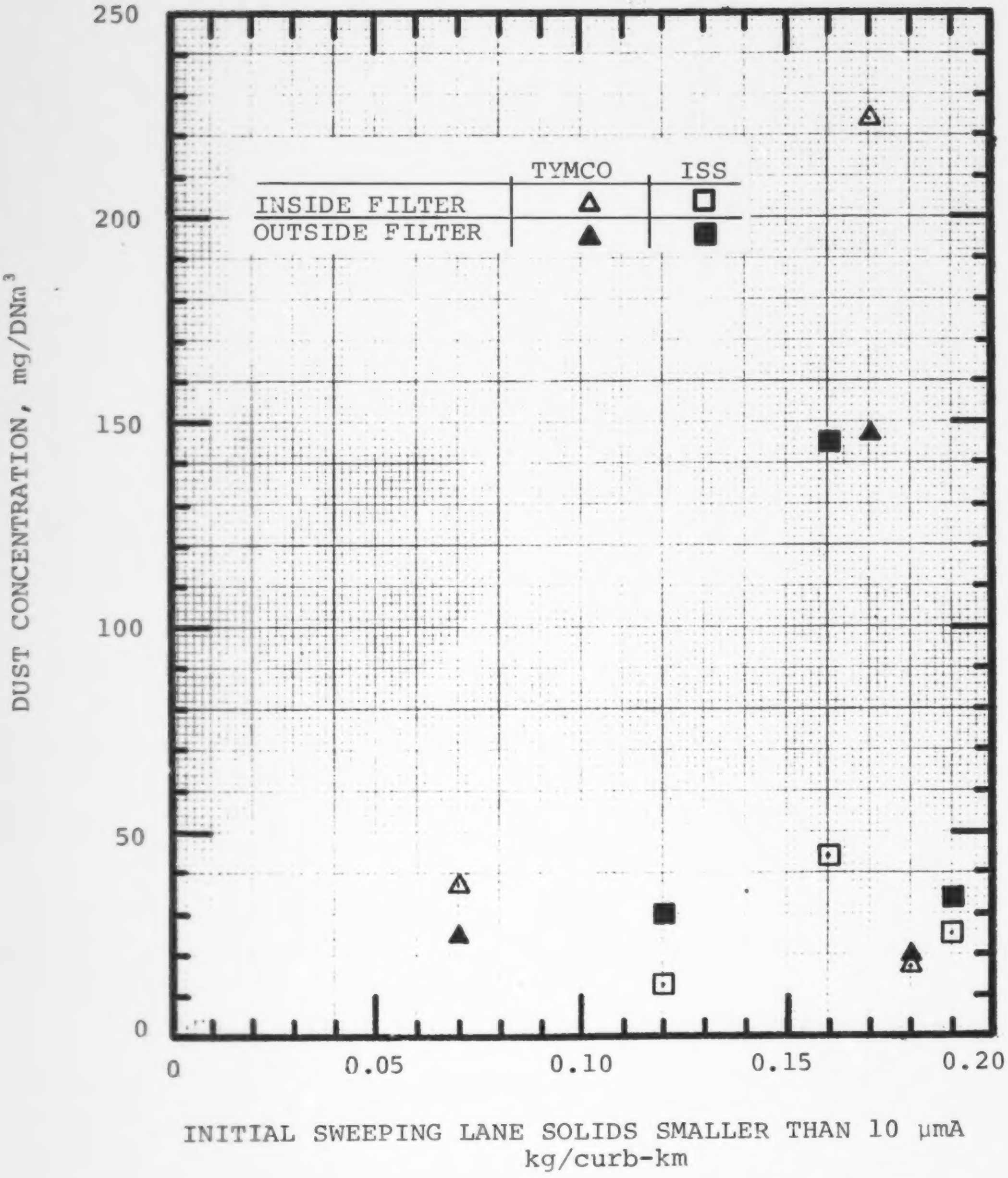


Figure 57. Relative dust dispersions of Tymco and ISS at Surrey Downs.

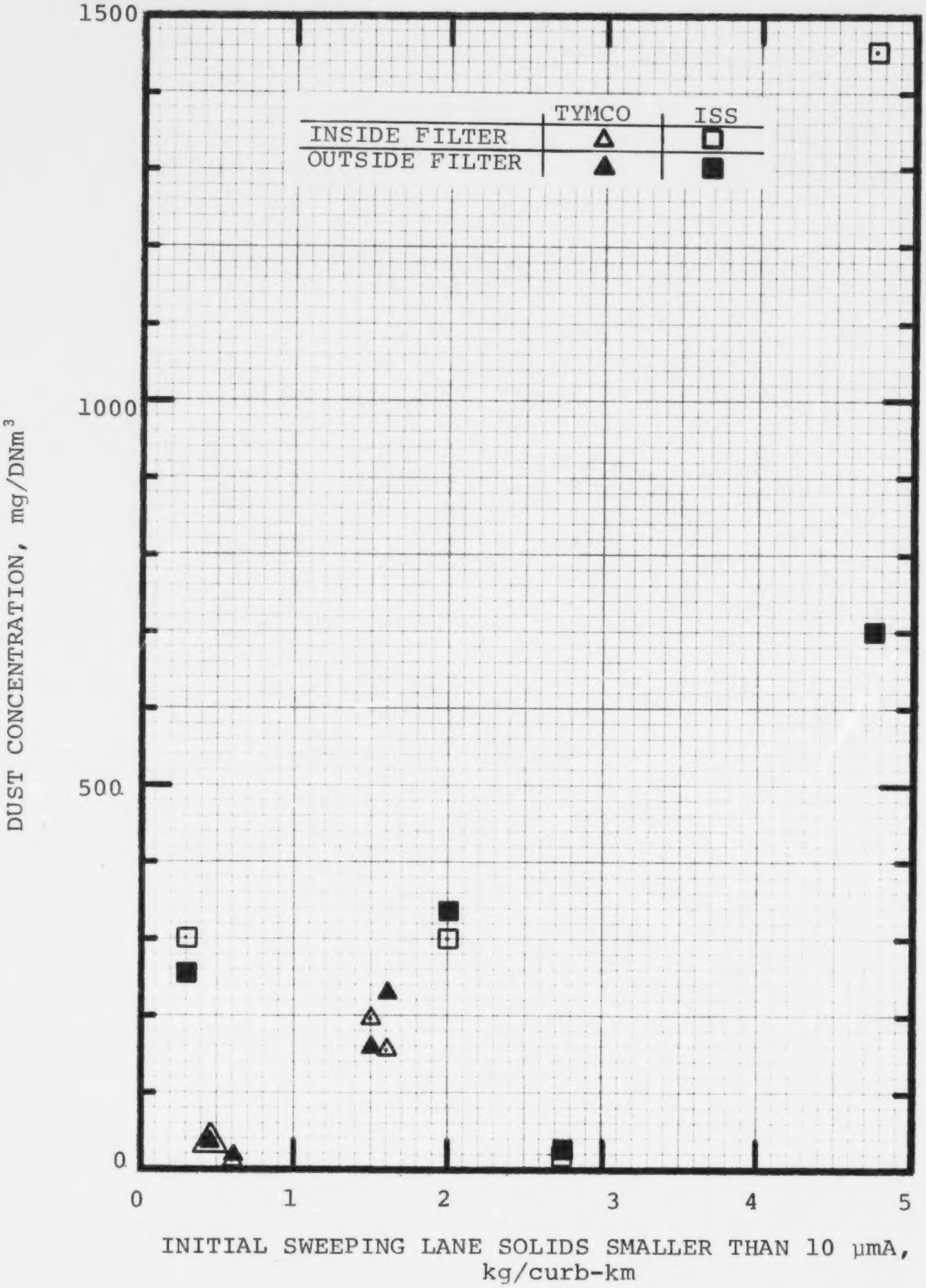


Figure 58. Relative dust dispersions of Tymco and ISS at Mission Blvd.

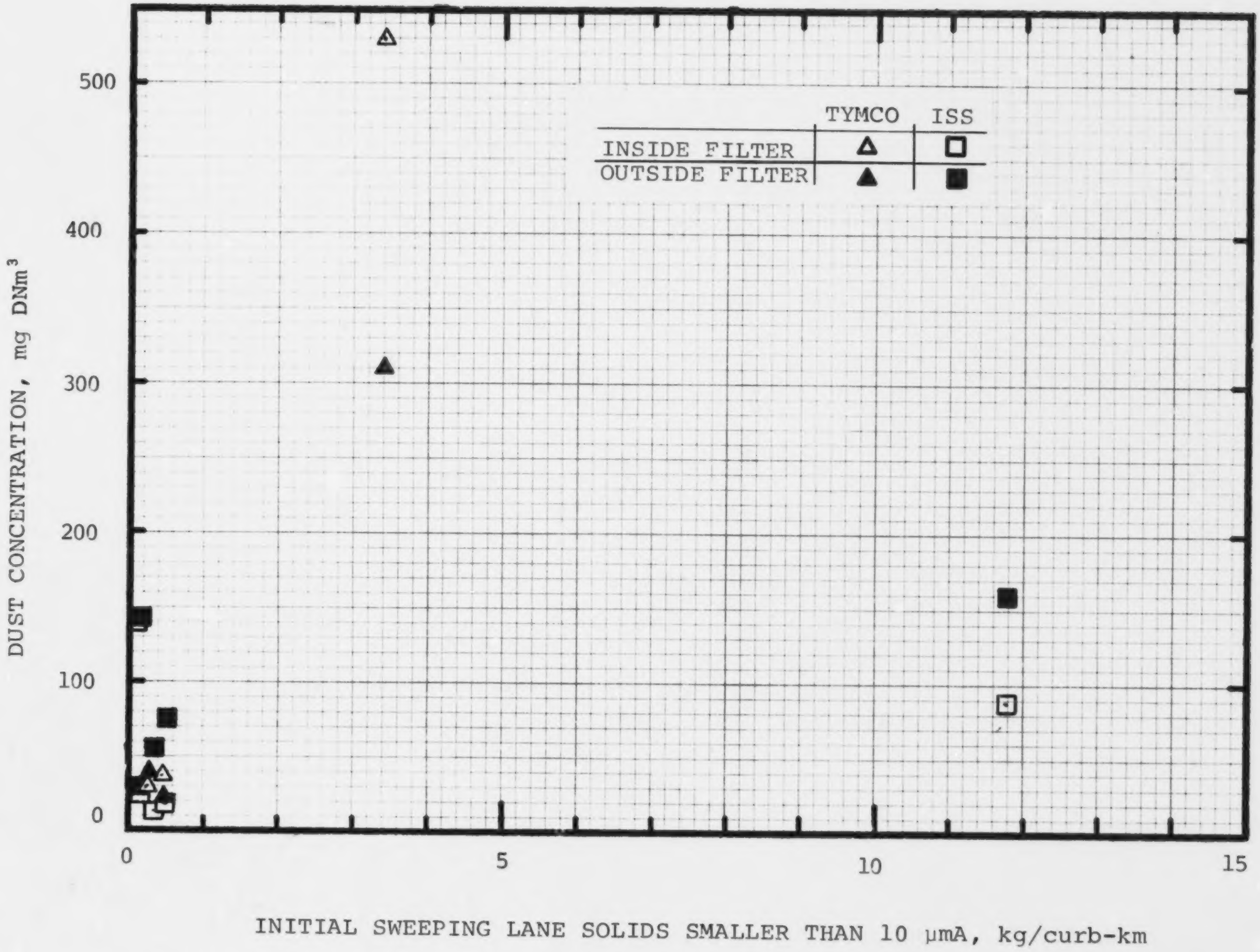


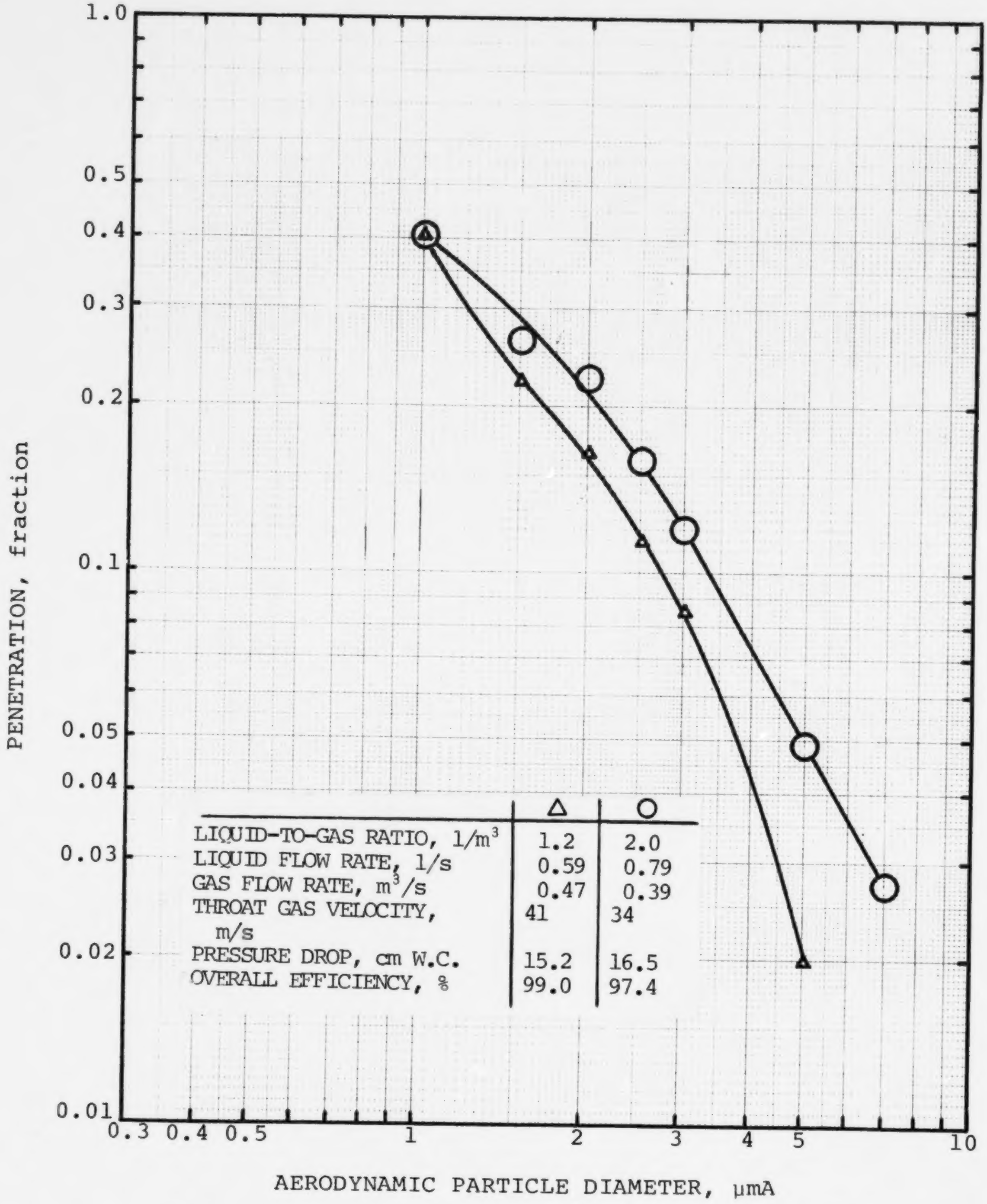
Figure 59. Relative dust dispersions of Tymco and ISS at Morena Blvd.

liquid-to-gas ratio decreases, because smaller drops are formed in the scrubber throat, which have higher collection efficiencies for sub-micron particles.

The ISS optimization tests were performed by simultaneously sampling the scrubber inlet and outlet gas streams with cascade impactors during street sweeping. Tests were completed for liquid-to-gas ratios of 2.0 l/m^3 (15.1 gal/1,000 ft^3) and 1.2 l/m^3 (9.3 gal/1,000 ft^3). The grade penetration curves of these tests are shown in Figure 60. The overall collection efficiency based on mass collected by the impactors was 99.0% for liquid-to-gas ratio of 1.2 l/m^3 and 97.4% for 2.0 l/m^3. A liquid-to-gas ratio of 1.2 l/m^3 was finally chosen because it required less water and allowed a 20% higher gas flow rate.

Emission Characteristics

A typical size distribution for the ISS scrubber emissions is shown in Figure 61. The mass median diameter is about 2 µm aerodynamic and 94% of the emissions are smaller than 10 µm aerodynamic. The emission rate in mass per distance traveled was plotted versus the initial sweeping lane solids smaller than 10 µmA in Figure 62. Depending on the amount of initial dust on the street, the emission varied from 0.005 to 0.4 kg/curb-km, which corresponds with 2 to 40% of the initial street solids which were smaller than 10 µmA diameter. The average is about 10%.



	△	○
LIQUID-TO-GAS RATIO, $1/m^3$	1.2	2.0
LIQUID FLOW RATE, 1/s	0.59	0.79
GAS FLOW RATE, m^3/s	0.47	0.39
THROAT GAS VELOCITY, m/s	41	34
PRESSURE DROP, cm W.C.	15.2	16.5
OVERALL EFFICIENCY, %	99.0	97.4

Figure 60. Penetration curves of ISS Venturi scrubber.

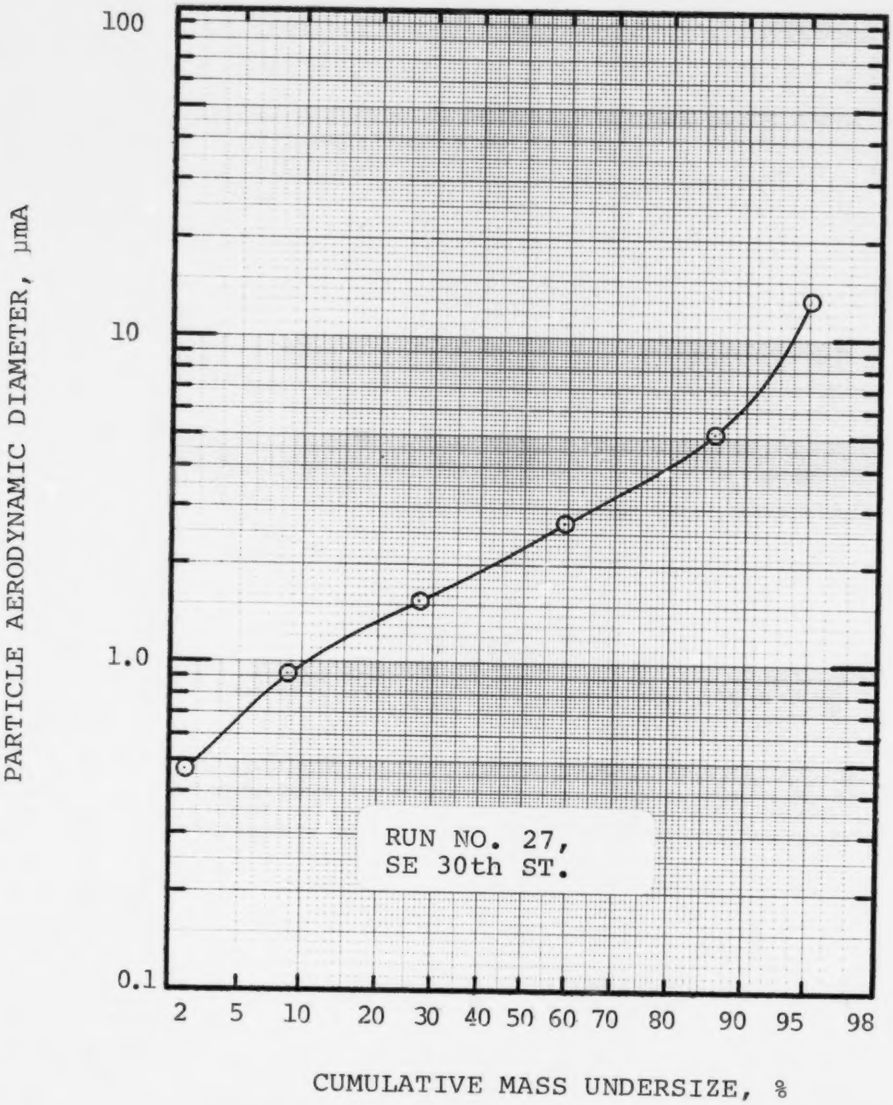


Figure 61. A typical size distribution of the ISS scrubber emissions.

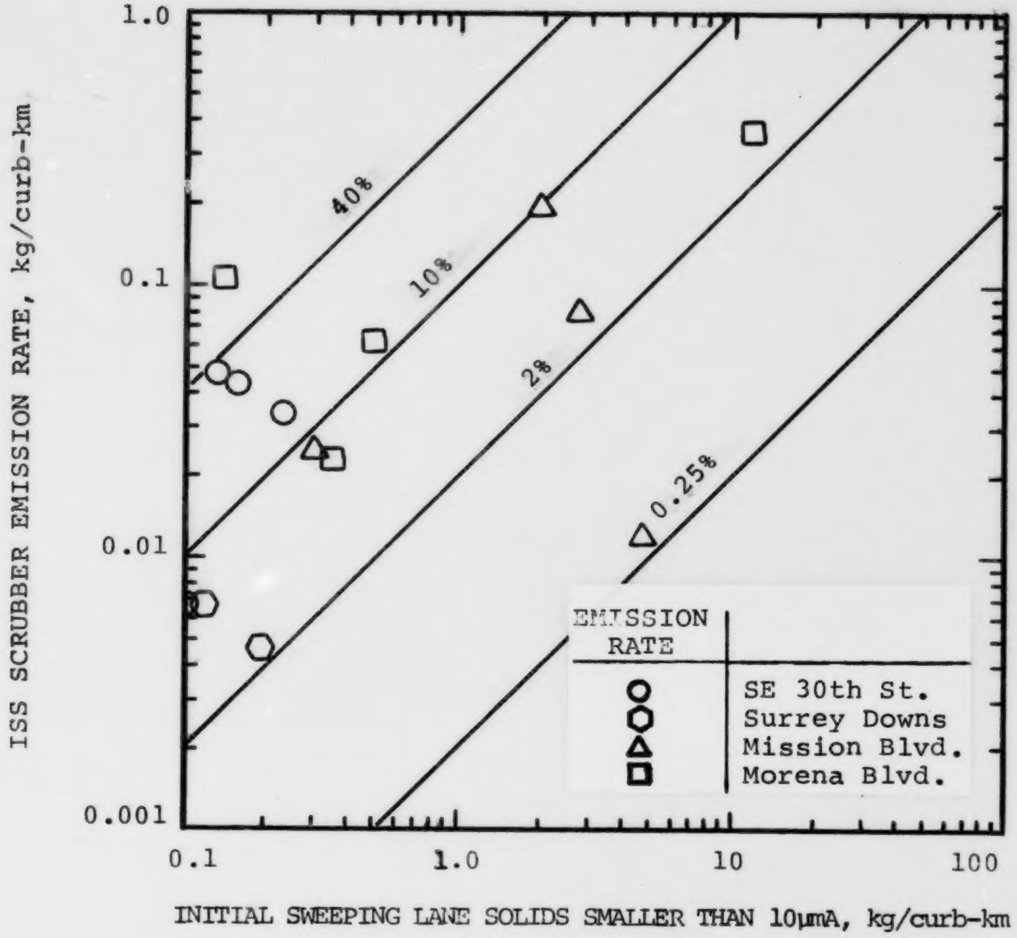


Figure 62. ISS scrubber emissions.

SECTION 6

CONCLUSIONS

The ISS was evaluated along with other conventional sweepers in Bellevue, Washington, and in San Diego, California. The results show that the Improved Street Sweeper (ISS) removes more street solids than the same sweeper without the improvements and the widely used broom sweepers. Typically, a broom sweeper removes 20% of the street solids, the Tymco sweeper removes 70%, and the ISS removes 80%. Additionally, the ISS was the only sweeper that gave a constant, low level of residual street solids that was independent of the initial amount of solids on the street. However, the residual level does depend on the street surface characteristics.

Based on visual observations, the ISS dispersed less dust during sweeping. However, the data from measurements of the dust concentration at the pickup head of the Tymco and the ISS were too scattered to allow statistical verification.

The particle mass emission from the scrubber on the ISS was roughly 10% of the initial street solids smaller than 10 microns-aerodynamic. The mass median diameter of the emissions was 2 microns-aerodynamic.

SECTION 7

RECOMMENDATIONS

This evaluation shows that the Improved Street Sweeper (ISS) cleans streets better than conventional sweepers. However, its effects on ambient air quality has not been measured. To complete evaluation of the ISS, the emission factors of the ISS and conventional sweepers need to be measured. This could be accomplished by sampling ambient air upwind and downwind of streets during and between sweepings.

SECTION 8

QUALITY ASSURANCE

OBJECTIVES

The major measurement for the present study is the amount of dirt on the street surface. Since dust distribution on the street surface varies and there is no "blank" sample for calibration; the accuracy, precision, and completeness of sampling cannot be determined in an absolute way. The City of Bellevue used the same equipment and technique in street dust sampling for their water pollution study under contract to EPA and estimated that error was about ± 15% (Robert Pitt, Consulting Environmental Engineer, personal communication, August, 1982). Therefore, the quality assurance objective of the program is to ensure that the Bellevue procedure is followed closely such that the measured street dust initial and residual concentrations agree with the data file established by the City of Bellevue for mechanical sweepers.

RESULTS

The Bellevue test program started one month from the project starting date. In such a short period, EPA did not have enough time to evaluate the Quality Assurance Plan submitted by A.P.T. Because the water run-off project of the City of Bellevue was in its final phase, and the rainy season in Bellevue was to start shortly, EPA gave permission to A.P.T. to start the sampling program at Bellevue before the QA plan was approved, on the condition that the QA procedures contained in the QA plan be followed.

Most of the sampling and sample handling were done by Bellevue personnel during the Bellevue test program. The A.P.T. Quality Assurance Manager traveled to Bellevue and spent three weeks in Bellevue to train Bellevue personnel on impactor operations and to ensure that the QA procedures were followed. During sampling in San Diego, the QA Manager visited the site regularly to observe the sampling.

Details about the QA program and findings are presented in the following sections.

Cascade Impactor Calibration

Four University of Washington Mark III cascade impactors were used in Bellevue. These four impactors had just been returned from a field trip to a waste incineration plant. Observation of the jet plates under a microscope revealed that the jet holes on lower stage jet plates were enlarged due to corrosion. Based on the measured jet diameter, it was concluded that the "cut impaction parameter, K_{p50}" would deviate more than 5% from the previous calibration. According to the QA plan submitted to EPA, a detailed impactor calibration was needed. However, because of time limitations, the impactors were not re-calibrated before the Bellevue tests.

The impactors were re-calibrated after the Bellevue tests and before the San Diego tests according to the calibration method developed by A.P.T. (Calvert et al., 1976). It was found that cut impaction parameters, K_{p50}, were about 12% higher than those of the previous calibration. Since the impactors were used to sample ambient air and street dust in Bellevue, no further corrosion of the jet holes was expected. Therefore, it was assumed that the impactor calibration before the Bellevue tests was the same as that after the tests. The impactor data reduction for the Bellevue tests was based on the new calibration. All of the impactors used for the San Diego tests were calibrated just before the San Diego test program began.

Sampling Train Calibratio

Four sampling trains were used in the sampling program. Before the sampling trains were shipped to Bellevue, the sampling trains were serviced and the dry gas meter and the orifice meter were checked for 5 points on the existing calibration curve with a factory calibrated and certified dry gas meter. The quick check differed less than 2% from the existing calibration.

After the Bellevue tests and just before the San Diego tests, all sampling trains were recalibrated (not just a quick check). The rotameter, orifice meter, and the dry gas meter were calibrated against a certified dry gas meter. (Note: The calibration equipment set-up deviated slightly from that mentioned in the QA plan. The QA plan specified the use of a wet test meter. However, the wet test meter was broken at the time and was sent out for repair. Therefore, a factory calibrated and certified dry gas meter was used in its place). Two of the trains were found to have no change in calibration. The dry gas meters in the other two trains had a flow rate about 2% higher than the last calibration.

Data reduction for both Bellevue and San Diego tests was based on the new calibrations.

Vacuum Cleaner System

The gas flow rate in the vacuum hose of the street dust sampler was determined and calibrated with a standard pitot tube traverse according to EPA Method 1. After the calibration, the pitot tube was kept at one location for flow monitoring.

The pickup head of the Bellevue sampler, illustrated in Figure 10, is a Tornado catalogue No. 90321 hand gulper nozzle. It has three cutouts in its bottom edge. When new, the cutouts are 3.2 mm (0.125 in) deep. As the aluminum pickup head is used, its bottom edge wears away, causing the cutouts to become shallower. As the cutouts become shallower, the inward airflow through the cutouts decreases and the vacuum inside the head increases.

To limit variation in airflow and vacuum, the pickup head cutouts were inspected daily before performing tests. Whenever the depth of a cutout got as small as 1.6 mm (0.063 in), it was restored to 3.2 mm (0.125 in) by using a grinding wheel or file.

Also, whenever the bottom surface of the pickup head reached the bottom of its circular neck, the head was replaced with a new one.

Sample Processing

Vacuum Cleaner Samples

After each street dust sampling, the solids collected by both vacuum cleaners were transferred to a clean 0.9 l (1 qt.) glass jar. The jar was capped with a tight-sealing lid and labeled with the run number, type of sample (half street or swept lane), and date. The jar was transferred to the laboratory along with its data sheet at the end of each day.

The laboratory technician emptied the contents of the glass jar to a tared metal tray and then weighed it to obtain the wet sample weight. The sample was dried at 70°C (158°F) for at least 12 hours, and then weighed again for dry weight.

In Bellevue, all weights were measured to the nearest 0.1 gram with an electronic scale; and in San Diego, a mechanical "triple beam" balance was used. Both balances were daily checked against standard weights.

The sample was then sieved with standard ASTM 8-inch diameter sieves and each size fraction was weighed.

The sieve analysis weights were reviewed by the Project Engineer to perform a preliminary calculation on size distribution. If it differed substantially from established data for a test area, then the sieve analysis as repeated. Of the 112 San Diego samples, 2 samples were found to have deviating distributions. Sieve analyses were redone on these 2 samples, and it was found that the weights had been misread from the balance during the original analyses, causing errors of 40.0 and 500.0 grams.

Cascade Impactor Samples

The cascade impactor samples were processed according to EPA guidelines (Harris, 1977). Before and after being used, the final filters and impactor substrates of the impactors were dried at 105°C (221°F) for 2 hours and then dessicated (in a camper cooler with silica gel) at room temperature for at least 22 hours. The weights of the filters and substrates were measured to the nearest 0.1 mg with an electronic balance. At the beginning of each day's weighing, a standard 50 gram weight was used to calibrate the balance.

Internal Quality Control Checks

Internal quality control checks were used to ensure valid data collection. For particle samplings, the guidelines for operational checks, control limits, and corrective actions are summarized in Table 1. These checks were considered continually by the persons performing the sampling and sample processing. In addition the Project Engineer made weekly observations of the methods used by the technicians. When any deviation was observed, corrective instructions were given. No problems were discovered during the internal checks.

Performance Audits

Sampling and data analysis procedures (including computations) were audited by A.P.T.'s Quality Assurance Manager. For each test area, the methods were observed for compliance with the Quality Assurance Plan. No deviations from the plan were found during these audits.

TABLE 1. INTERNAL QC CHECK FOR PARTICLE SAMPLING

Operation Check	Control Limits	Planned Corrective Action
1. Calibrations	1. Calibration	1.
a. Dry gas meter	a. ± 1%	a. b. & c. Recalibrate
b. Rotameter	b. ± 1%	
c. Orifice meter	c. ± 1%	
d. Thermocouple	d. ± 1°C of reference thermometer	d. Replace thermocouple
e. Nozzles	e. 3 measurements within ± 0.01 cm	e. Reshape, sharpen, & recalibrate
f. Field barometer	f. ± 0.1 in. Hg of mercury-in-glass barometer	f. Use National Weather Service information
g. Electronic balance	g. adjust to ± 0.1 mg of standard weight	g. Return to manufacturer for service
h. Field balance	h. ± 0.5 g of standard weight	h. Adjust or return to manufacturer
2. Filters	2. Properly desiccated, labeled, no tears, weighted, installed	2. Replace
3. Impactor substrates	3. Properly desiccated & labeled flat and no grease underneath	3. Replace
4. Sample containers	4. Clean polyethylene bottle properly labeled	4. Replace
5. Acetone	5. Reagent grade 0.001% glass bottle	5. Replace

Results

Figure 63 shows all the data collected by the City of Bellevue in its water runoff project for the Mobil sweeper along with that obtained in this study. It can be seen that the results from this study agree with those obtained by Bellevue. Therefore, we are confident that the data obtained were consistent and valid.

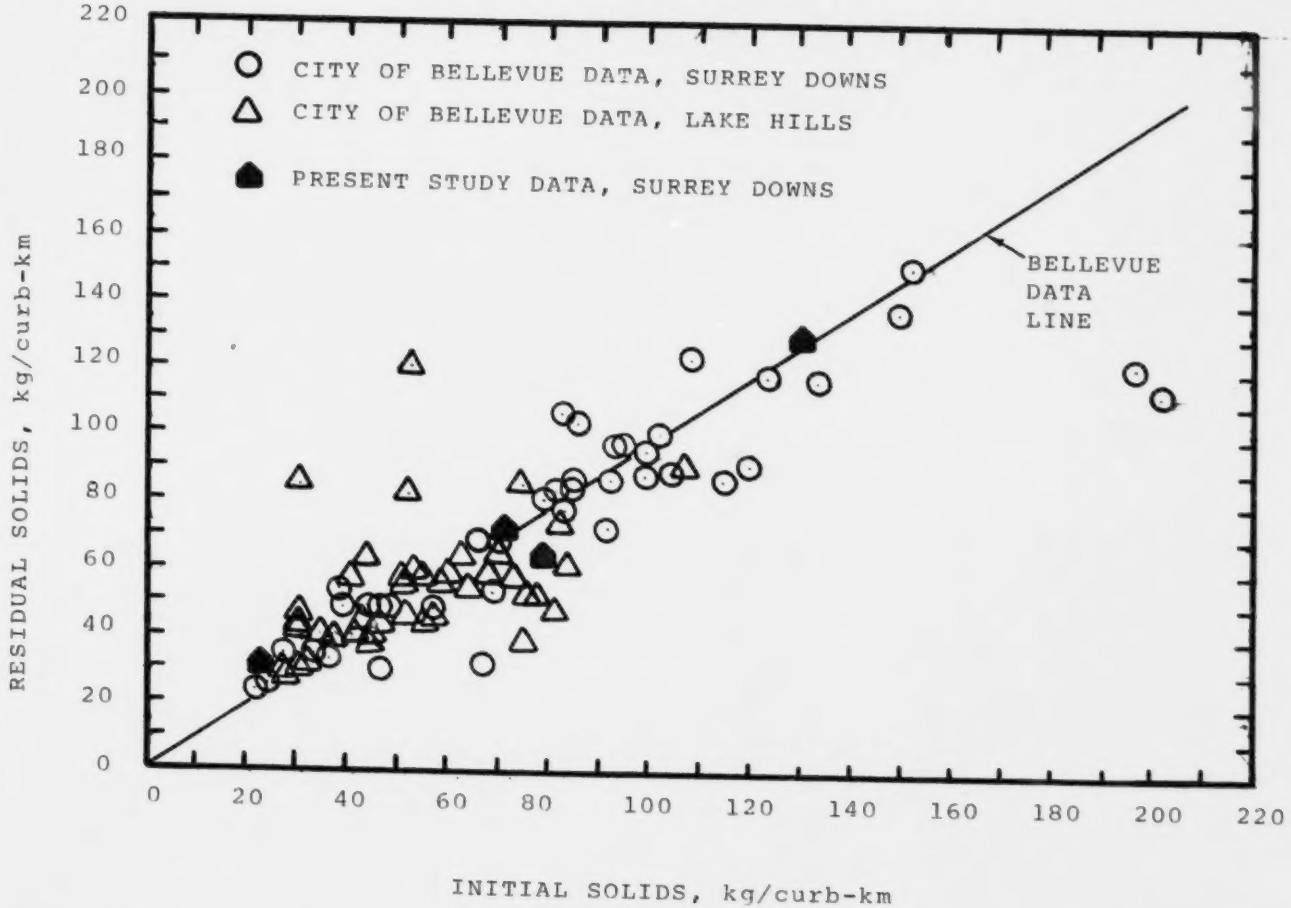


Figure 63. Comparison of present study data to City of Bellevue data, for Mobil sweeper, from half-of-street samples.

REFERENCES

Bradway, R. and F. Record. National Assessment of the Urban Particulate Problem Volume 2: Particle Characterization. EPA-450/3-76-025 (NTIS No. PB263666), U. S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1976.

Calvert, S., J. Goldshmid, D. Leith, and D. Mehta. Scrubber Handbook. EPA-R2-72-118a (NTIS No. PB213016), A.P.T., Inc., Riverside, California, 1972.

Calvert, S., C. F. Lake, and R. D. Parker. Cascade Impactor Calibration Guidelines. EPA-600/2-76-118 (NTIS No. PB252656), U. S. Environmental Protection Agency, Research Triangle Park, North Carolina 1976.

Draftz, R. The Impact of Fugitive Dust Emissions on TSP Concentrations in Urban Areas. In Third Symposium on Fugitive Emissions: Measurement and Control. EPA-600/7-79-182 (NTIS No. PB80-130891), U. S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1979.

Harris, D.B. Procedures for Cascade Impactor Calibration and Operation in Process Streams. EPA-600/2-77-004 (NTIS No. PB263623), U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1977.

Pitt, R. Demonstration of Nonpoint Pollution Abatement Through Improved Street Cleaning Practices. EPA-600/2-79-161, U. S. Environmental Protection Agency, Cincinnati, Ohio 1979.

Pitt, R. Characterization, Sources, and Control of Urban Runoff by Street and Sewage Cleaning. Contract R-805929012, U.S. Environmental Protection Agency, Cincinnati, Ohio, publication expected in 1984.

Roberts, J.W. The Measurement, Cost, and Control of Air Pollution from Unpaved Roads and Parking Lots in Seattle's Duwanish Valley. M.S. Thesis, University of Washington, 1973.

U. S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors Supplement 8. AP-42 (NTIS No. PB288905), Office of Air and Waste Management and Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, 1978.

Yung, S., S. Calvert, and H. Barbarika. Venturi Scrubber Performance Model. EPA-600/2-77-172 (NTIS No. PB271515), U. S. Environmental Protection Agency, Research Triangle Park, North Carolina, 1977.

APPENDIX "A"

DATA ANALYSES

Data Reduction

Cascade Impactor Data

The particle diameter measured by a cascade impactor is called "aerodynamic diameter", and it has the units of "microns-aerodynamic, μmA". This is the effective diameter for particle separation by inertial impaction, and it takes into account the effects of particle density and particle slip between gas molecules. Aerodynamic diameter is related to geometric diameter (actual size) by the following relationship (Calvert, 1972):

$$d_{pa} = d_p \, (C' \, \rho_p)^{0.5} \qquad \text{(A-1)}$$

where: d_{pa} = aerodynamic diameter, $\mu mA = \mu m \, (g/cm^3)^{0.5}$
d_p = actual diameter, μm
C' = Cunningham slip factor, dimensionless
ρ_p = particle density, g/cm^3

The Cunningham slip factor is a complex function of the mean free path of the gas and the particle diameter. It increases as temperature increases and as pressure decreases. For air at standard temperature and pressure it is given approximately by:

$$C' = 1 + \frac{0.165}{d_p} \qquad \text{(A-2)}$$

The cut diameters for the impactor stages are determined from the sampling flow rate and impactor calibration according to the following equation:

$$d_{pc} = K_{p50} \left(\frac{9 \, \mu_G \, d_j}{u_j} \right)^{0.5} \qquad \text{(A-3)}$$

where: d_{pc} = aerodynamic cut diameter of impaction stage, $\mu mA = \mu m \, (g/cm^3)^{0.5}$ where:

K_{p50} = impactor calibration constant, dimensionless

d_j = jet diameter, cm

u_j = jet velocity, cm/s

μ_G = gas viscosity, g/cm-s

Calculations for the cascade impactor data reduction were performed with computer programs. The equations of the programs are illustrated in the manual calculation sheets of Figures 64 through 68.

Street Solids Data

The loadings of street solids were calculated according to the following equation:

$$S = \frac{m}{L} \qquad \text{(A-4)}$$

where: L = length of curb that the sample represents, curb-km

S = street solids loading, g/curb-m

m = sample mass, g

The length of curb that the sample represents is calculated from the following equations:

For sieve analysis masses, $L = nw$ (A-5)

For cascade impactor masses, $L = \frac{nwq}{Q}$ (A-6)

Figure 64. Cascade impactor calculation sheet 1.

CALCULATION SHEET #1

Project # ________ Run # ______ Location ______________ Date ______ Initials ___

FPEIS Subseries # ________ FPEIS Run # ________ Notes ____________________

STACK CONDITIONS

Pressure

a Atmospheric pressure = ⓐ + ______ in Hg

b Stack gage pressure = ⓑ - ______ in Hg (= in. W.C./13.6)

c Stack absolute pressure = ⓐ + ⓑ = ⓒ ______ in Hg x 25.4 = ______ mm Hg
(Form 3 - D03-70
Form 6 - I01-65)

Temperature

d Stack gas temperature = ⓓ ______ °R (______ °F) (______ °C)
(°C on Form 3-D03-66)

Water Volume % based on wet and dry bulb temperatures of stack gas

e Dry bulb temperature = ⓔ ______ °R (______ ° ___)

f Wet bulb temperature = ⓕ ______ °R (______ ° ___)

g Relative humidity (from psychometric chart, etc.) = ⓖ ______ %
(Deviations from standard pressure must be accounted for)

h Saturation pressure @ dry bulb temperature (from tables) = ⓗ ______ in Hg

i Water volume = ⓖ x ⓗ / ⓒ = ⓘ ______ %

Water Volume % based on catch in impingers and dessicant of sampling train

j Mass of water collected = ⓙ ______ g or ml

k Vapor volume of collected mass @ 20°C, 1 atm = 0.04712 x ⓙ = ⓚ ______ ft^3

l Water volume % = $\frac{100 \times \textcircled{k}}{\textcircled{gg} + \textcircled{k}}$ = ⓛ ______ %

If ⓛ is different from ⓘ explain: ______________________________

____

m Water volume % to be used for stack flow rate calculations = ⓜ ______ %
(Form 3-D03-75)

n Water volume % to be used for impactor flow rate calculations = ⓝ ___ %
(Form 6-I01-70)

Stack gas flow rate

o Pitot coefficient = ⓞ __________

p Dry gas molecular weight = ⓟ _____
If ⓟ does not equal 29 explain: (Orsat analysis on Sheet 5)

____

Stack gas molecular weight

q $= \textcircled{p} \times \left(1 - \frac{\textcircled{m}}{100}\right) + \left(18 \times \frac{\textcircled{m}}{100}\right) = \textcircled{q}$ ______

r Average velocity head measured = ⓡ ______ in. W.C.

s Stack cross sectional area = ⓢ ______ ft^2

Figure 65. Cascade impactor calculation sheet 2.

CALCULATION SHEET #2

Run # ______

Stack gas flow rate:

t $= 5{,}131 \times \textcircled{o} \times \textcircled{s} \times \frac{\sqrt{\textcircled{r} \times \textcircled{d}}}{\sqrt{\textcircled{q} \times \textcircled{c}}} = \textcircled{t}$ ______ACFM

Standard flow rate, wet @ 20°C, 1 atm

u $= \textcircled{t} \times \frac{\textcircled{c}}{29.92} \times \frac{528}{\textcircled{d}} = \textcircled{u}$ ______SCFM, wet

Dry standard flow rate 20°C, 1 atm

v $= \textcircled{u} \times \left(1 - \frac{\textcircled{m}}{100}\right) = \textcircled{v}$ ______SCFM, dry

w Stack gas flow rate $= 4.72 \times 10^{-4} \times \textcircled{t} = \textcircled{w}$ ______actual, m^3/s

Normal flow rate, wet 20°C, 1 atm

x $= \textcircled{w} \times \frac{\textcircled{c}}{29.92} \times \frac{528}{\textcircled{d}} = \textcircled{x}$ ______Nm^3/s, wet

Dry normal flow rate 20°C, 1 atm

y $= \textcircled{x} \times \left(1 - \frac{\textcircled{m}}{100}\right) = \textcircled{y}$ ______DNm^3/s (Form 3-D03-56)

SAMPLING VOLUMES

Dry gas meter sampled volume

z Dry gas meter volume sampled = $\textcircled{z}$ ______ ft^3

aa Average or compensated DGM temp. = $\textcircled{aa}$ _____°R (______°__)

bb Orifice meter upstream ΔP = $\textcircled{bb}$ ______ in Hg (= in. W.C./13.6) (from graphs based on $\textcircled{rr}$ values)

Calibration graph conditions:

cc Temperature = $\textcircled{cc}$ ______°R

dd Pressure = $\textcircled{dd}$ ______ in Hg

ee Sampled dry volume at calibration conditions $= \textcircled{z} \times \frac{\textcircled{a} + \textcircled{bb}}{\textcircled{dd}} \times \frac{\textcircled{cc}}{\textcircled{aa}} = \textcircled{ee}$ ____ft^3

ff True (calibrated) dry volume at calibration conditions (from graph) = $\textcircled{ff}$ ____ft^3

Dry standard volume @ 20°C, 1 atm

gg $= \textcircled{ff} \times \frac{\textcircled{dd}}{29.92} \times \frac{528}{\textcircled{cc}} = \textcircled{gg}$ ______ ft^3, dry std.

hh Dry normal volume @ 20°C, 1 atm $= 0.02832 \times \textcircled{gg} = \textcircled{hh}$ ______DNm^3

Rotameter sampled volume (dry)

ii Sampling time = $\textcircled{ii}$ ______ min (Form 6-I01-50)

jj Rotameter temperature = $\textcircled{jj}$ ______°R (______°__)

kk Average vacuum reading = $\textcircled{kk}$ _____ in Hg

Figure 66. Cascade impactor calculation sheet 3.

CALCULATION SHEET #3 Run # _____

ll Rotameter absolute pressure = (a) - (kk) = (ll) ______ in Hg

mm Rotameter S.S. ball reading = (mm) ______

nn Volume flow rate from calibration graph for (mm) and (ll) = (nn) ____CFM

Calibration conditions:

oo Temperature = (oo) _______°R (_____°__)

pp Molecular wt (pp) _______

qq Sampled volume = $(nn) \times (ii) \times \dfrac{\sqrt{(jj) \times (pp)}}{\sqrt{(oo) \times (p)}} = (qq)$ ______ft³

Dry standard volume @ 20°C, 1 atm

rr = $(qq) \times \dfrac{528}{(jj)} = (rr)$ ______ft³, dry std.

Orifice meter sampled volume (dry)

ss Orifice ΔP = (ss) _______ in. W.C.

tt Proportionality factor (K_m) for (ss) = (tt) ______(from calculation on orifice graph)

uu Orifice meter upstream temperature = (uu) ______°R (_____°__)

vv Orifice meter upstream pressure = (a) + (bb) = (vv) ______ in Hg

ww Sampled volume = $(tt) \times (ii) \times \dfrac{\sqrt{(uu) \times (ss)}}{\sqrt{(vv) \times (p)}} = (ww)$ ______ ft³

Dry standard volume @ 20°C 1 atm

xx = $(ww) \times \dfrac{(vv)}{29.92} \times \dfrac{528}{(uu)} = (xx)$ ______ ft³, dry std.

Sampled dry standard volume

Compare (xx) and (rr) with (gg) , comments: ____________________________

____

yy Sampled dry standard volume at 20°C, 1 atm = (yy) ______ ft³, dry std.

SAMPLING FLOW RATE

zz Impactor temperature = (zz) ______°R (_____°__) _____° (Form 6-I01-61)

Actual flow rate (wet)

aaa = $0.05667 \times \dfrac{(yy)}{(ii)} \times \left(\dfrac{1}{1 - \frac{(n)}{100}}\right) \times \dfrac{(zz)}{(c)} = (aaa)$ ______ACFM

bbb Actual flow rate (wet) = (aaa) x 28.316 = (bbb) ______ℓ/min (Form 6-I01-55)

ccc Velocity head measured at sampling nozzle = (ccc) ______ in. W.C.

ddd Velocity at nozzle = $10.76 \times \left((w) \times \sqrt{(ccc)}\right) / \left(\sqrt{(r)} \times (s)\right) = (ddd)$ ______ m/s (Form 3-D03-62)

Figure 67. Cascade impactor calculation sheet 4.

CALCULATION SHEET #4 Run # ______

eee Sampling nozzle diameter = eee ______ inches

fff *** Velocity in nozzle = 0.931 x aaa / eee^2 = fff ______ m/s

ggg Percent isokinetic = 100 x fff / ddd = ggg ______ %

PARTICULATE LOADING AND PARTICLE SIZE DISTRIBUTION CALCULATIONS

Stage No.	Each Stage		Cumulative Mass		Mass % Under Cut Size	Cut Size d_{p50}, μmA
	mg (dry)	mg/DNm³* (Exponent form)	mg	mg/DNm³ x ___		
Probe						
Pre-cutter						
1						
2						
3						
4						
5						
6						
7						
8						.1 **
Filter						
Impinger						

* Method 5 or filter data - probe and filter weights should be added together and entered on Form 4-E01-16-25; impinger wt. plus this other wt. should be added together and entered on Form 4-E01-26-35; impactor data - probe, precutter, and stage 1 wt. should be added together along with any other stages with cut sizes larger than the precutter (if it is used) and entered as one weight on Form 6-J04-17-23; impinger and final filter weights should be added together and entered as one weight.

** There should be one more cut size than mass entry per run. Last cut size should be from Form 6-I02-16-20 and entered on Form 6-J01 or J02. First cut size should be upper limit (Form 6-I02-21-25).

*** Note: If nozzle is not at the same temperature as the impactor "aaa" should not be used in calculating "fff". Instead use the actual flow rate at the nozzle entrance.

Figure 68. Cascade impactor calculation sheet 5.

CALCULATION SHEET #5 Run # ______

MASS EMISSIONS

Total particulate loading

hhh Total particulate mass collected = (hhh) ________ mg

iii Dry loading = 35.315 x (hhh) / (yy) = (iii) ________ mg/DNm^3 @ 20°C, 1 atm

jjj Dry loading = 0.0154 x (hhh) / (yy) = (jjj) ______ $grains/ft^3$, dry std @ 20°C, 1atm

kkk Wet loading = (jjj) x $\left(1-\frac{(m)}{100}\right)$ = (kkk) ______ $grains/ft^3$, wet @ 20°C, 1 atm

Mass Emission Rate

lll Emission rate = 0.00794 x (iii) ____ x (y) ____ = (lll) ____ lbm/hr

FPEIS ADDITIONAL INFORMATION

Source Operating Mode ____________________________ (Form 3-D01-30-59)
Consult FPEIS Manual for Standard Nomenclature, pgs. 2.1.8-3 to 2.1.8-12)

Source Operating Rate ____________________________ (Form 3-D01-60-76)
Consult FPEIS Manual for Standard Units - pgs. 2.1.8-3 to 2.1 8-12)

Sampling location description ____________________________

____________________________ (Form 3-D03-16-55)

Control device operating parameters (see page 2.1.8-18 in FPEIS Manual for operating parameters and units - additional parameters and units may also be added.

____

____

____

____

____________________________ (Forms 3,4-D05-18-67)

Orsat Analysis: CO_2 ________ decimal fraction (Form 3-D04-16-19)
CO ________ decimal fraction (Form 3-D04-20-23)
O_2 ________ decimal fraction (Form 3-D04-24-27)
N_2 ________ decimal fraction (Form 3-D04-28-31)

Density ________ g/cm^3 (Form 4-F01-16-19)

Impactor No. ________ (if UofW impactor used enter "UW Mark III impactor" on Form 6-I01-16-45)

Dilution factor ________ (Form 6-I01-76-80)

Measurement size range: Lower ______ µmA, Upper ______ µmA (Form 6-I02-16-25)
(Lower for impactors is 0.1 µmA and upper is about 5.0 µmA above highest cut size for stage 1 or precutter)

Collection surface or substrate ____________________ (Form 6-I02-26-80) where: n = number of strips vacuumed for the sample, dimensionless

w = width of a sampled strip, m

q = volumetric flow rate of cascade impactor, m^3/s

Q = volumetric flow rate of sampler, m^3/s

Dust Dispersion Data

The dust concentrations for the relative dust dispersion measurements were calculated from this simple formula:

$$C = M/V \tag{A-7}$$

where C = dust concentration, mg/DNm^3

M = mass collected on filter, mg

V = dry normal sample volume, DNm^3

ISS Scrubber Emissions

The mass emission rate of the ISS scrubber was calculated from the following equation:

$$E = \frac{M_S Q_G}{D\ q_S} \tag{A-8}$$

where E = mass emission rate of ISS scrubber, kg/curb-km

M_S = total mass collected in cascade impactor at scrubber outlet, kg

Q_G = gas volumetric flow rate of the scrubber, m^3/s

D = distance traveled by sweeper during emission sampling, curb-km

q_S = gas volumetric flow rate of sample at scrubber outlet, m^3/s

Statistical Analyses

In the evaluation of sweeper performance, straight lines were fitted to the data points using least-squares linear regression. In some cases, the confidence region of a regression was derived. Descriptions of these analyses follow.

Least-Squares Linear Regression

This method derives a straight line to fit a group of data points, such as

$$(x_1, y_1), (x_2, y_2), \ldots, (x_n, y_n)$$

where n = number of data points.

This method minimizes the sum of the squares of the y-distance from the data points to the line.

The equation of the line is

$$y = a + bx \tag{A-9}$$

where: $a = \bar{y} - b\bar{x}$ (A-10)

$$b = \frac{S_{xy}}{S_x^2} \tag{A-11}$$

$$\bar{y} = \frac{1}{n} \sum_{j=1}^{n} y_j \tag{A-12}$$

$$\bar{x} = \frac{1}{n} \sum_{j=1}^{n} x_j \tag{A-13}$$

$$S_{xy} = \frac{1}{n-1} \sum_{j=1}^{n} (x_j - \bar{x})\ (y_j - \bar{y}) \tag{A-14}$$

$$S_x^2 = \frac{1}{n-1} \sum_{j=1}^{n} (x_j - \bar{x})^2 \tag{A-15}$$

The correlation coefficient indicates how close the data points are to lying on a straight line. The correlation coefficient ranges from -1 to 1. The closer the correlation coefficient is to 1 or -1, the closer the data points fit a straight line. If the correlation coefficient is zero, the data points are said to be uncorrelated. The following equations define the correlation coefficient.

$$\text{Correlation Coefficient} = r = \frac{S_{xy}}{S_x S_y} \qquad \text{(A-16)}$$

where: $$S_x = \left(S_x{}^2\right)^{0.5} \qquad \text{(A-17)}$$

$$S_y = \left(S_y{}^2\right)^{0.5} \qquad \text{(A-18)}$$

$$S_y{}^2 = \frac{1}{n-1} \sum_{j=1}^{n} (y_j - \bar{y})^2 \qquad \text{(A-19)}$$

The correlation coefficients of the study are quite high. For the correlation of the Bellevue and A.P.T. samplers, the correlation coefficient is 0.97. For the curve fitting of the total, sweeping-lane solids, the average of the absolute values of the correlation coefficient is 0.80. Thus it can be concluded that the street sweeper performances, in terms of residual versus initial solids, closely fit linear functions.

Regression Confidence Region

To indicate the degree of confidence of a linear regression, regions of 90% were derived.

The following equations for calculating confidence regions are based on these two assumptions:

(1) For each fixed x, the random variable y is normally distributed and has a variance that is independent of x;

(2) The n performances of the experiment by which we obtain a sample is obtained $(x_1, y_1), \cdots, (x_n, Y_n)$ are independent.

The confidence region lies between

$$y = a + bx - k(x), \text{ and} \quad \text{(A-20)}$$

$$y = a + bx + k(x) \quad \text{(A-21)}$$

where: $$k(x) = c\left[\frac{q}{(n-2)}\left(\frac{1}{n} + \frac{(x-\bar{x})^2}{(n-1)s_x^2}\right)\right]^{\frac{1}{2}} \quad \text{(A-22)}$$

c = the solution value of the t-distribution such that equation A-24 is satisfied (A-23)

$$F(c) = \frac{1}{2}(1+z) \quad \text{(A-24)}$$

F(c) = the t-distribution function for n-2 degrees of freedom

z = the confidence level (0.90 used for 90% confidence)

$$q = (n-1)\ (s_y^2 - b^2 S_x^2) \quad \text{(A-25)}$$

APPENDIX B -- BELLEVUE HALF-OF-STREET DATA

project 80, run no. 1b hs date 1 Sep 82
half street sample, 22.25 ft. strips, Bellevue sampler
location:s.e. 30th st. #1
sweeper type: BROOM

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	sample no. 1	sample no 2
	10 strips	10 strips
	13.5 cm wide	13.5 cm wide
	.00135 curb-km	.00135 curb-km
	.0008389 curb-mi	.0008389 curb-mi

size, microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	8			8.9		
37	25.7	5.925926	21.02383	52.9	6.592593	23.38902
63	109.2	24.96296	88.56290	188.1	45.77778	162.4091
125	256.7	105.8519	375.5382	317.3	185.1111	656.7320
250	284.8	296	1050.141	244.6	420.1481	1490.590
500	204.8	506.9630	1798.589	159	601.3333	2133.394
1000	109.8	658.6667	2336.799	92.1	719.1111	2551.242
2000	96.7	740	2625.351	89	787.3333	2793.279
6300	54.3	811.6296	2879.477	33.1	853.2593	3027.169
sieve sum	1150	851.8519	3022.176	1185	877.7778	3114.155
total before sieving	1149.4	851.4074	3020.599	1184	877.0370	3111.527

CASCADE IMPACTOR SAMPLES

	initial	residual
c.i. cfm:	.524	.575
vac. cfm:	123	123
	.0000058 curb-km	.0000063 curb-km
	.0000036 curb-mi	.0000039 curb-mi

size, aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.37			.04		
0.4	.1	.0643342	.2282470	.15	.0063382	.0224868
0.7	0	.0817218	.2899354	.21	.0301063	.1068121
1.2	.32	.0817218	.2899354	.4	.0633816	.2248676
2	1.64	.1373622	.4873783	2.02	.1267633	.4497352
4	1.18	.4225191	1.499028	2.09	.4468406	1.585316
10	1.47	.6276930	2.226951	.98	.7780097	2.760250
stage 1	3.65	.8832909	3.133770	7.04	.9332947	3.311175
precutter	2484.6	1.517939	5.385396	2669.5	2.048812	7.268845
total	2493.33	433.5307	1538.095	2682.43	425.0420	1507.979

```
project 80,  run no.       2bhs      date  1 Sep 82
half street sample,            22.25 ft. strips, Bellevue sampler
location:s.e. 30th st. #2 .
sweeper type:      ISS


                    INITIAL                               RESIDUAL

                              VACUUM CLEANER SAMPLES
                   sample no.        3               sample no.        4
                          20 strips                         20 strips
                        13.5 cm wide                      13.5 cm wide
                       .0027 curb-km                     .0027 curb-km
                    .0016778 curb-mi                  .0016778 curb-mi

                   ----cumulative----                ----cumulative----
          sieve    ---smaller than---      sieve     ---smaller than---
size,      wt.,    kg/       lb/            wt.,     kg/       lb/
microns     g       curb-km  curb-mi         g        curb-km  curb-mi

pan         93.3                           118.8
37         186.5 34.55556 122.5952         276.2        44 156.1020
63         529.2 103.6296 367.6543         615.5 146.2963 519.0259
125        762.5 299.6296 1063.018         813.9 374.2593 1327.787
250        820.7 582.0370 2064.935         853.2 675.7037 2397.243
500        480.8      886 3143.326         560.3 991.7037 3518.339
1000       201.6 1064.074 3775.092         217.6 1199.222 4254.567
2000       131.6 1138.741 4039.993           107 1279.815 4540.491
6300        44.5 1187.481 4212.914          30.1 1319.444 4681.088
sieve sum 3250.7 1203.963 4271.386        3592.6 1330.593 4720.639
total     3250.8     1204 4271.518          3595 1331.481 4723.793
 before
 sieving

                             CASCADE IMPACTOR SAMPLES
                   c.i. cfm:      .578               c.i. cfm:      .602
                   vac. cfm:       123               vac. cfm:       123
                    .0000127 curb-km                  .0000132 curb-km
                    .0000079 curb-mi                  .0000082 curb-mi

                   ----cumulative----                ----cumulative----
size,      stage   ---smaller than---      stage     ---smaller than---
aero.-      wt.,   kg/       lb/            wt.,     kg/       lb/
microns     mg      curb-km  curb-mi         mg       curb-km  curb-mi

filter       .59                            1.02
0.4          .44 .0465013 .1649791           .86 .0771872 .2738473
0.7         1.69 .0811803 .2880143          2.73 .1422665 .5047381
1.2         4.73 .2143791 .7605815          8.29 .3488557 1.237682
2          16.64 .5871780 2.083210         24.34 .9761905 3.463362
4           20.1 1.898674 6.736180         29.79 2.818088 9.998110
10          5.05 3.482872 12.35665          12.1 5.072407 17.99606
stage 1    49.73 3.880892 13.76876          60.1 5.988058 21.24464
precutter 10612.4 7.800404 27.67454       9112.1 10.53605 37.38015
total    10711.37 844.2256 2995.173      9251.33 700.0822 2483.776
```

project 80, run no. 3b hs date 2 Sep 82
half street sample, 22.25 ft. strips, Bellevue sampler
location:s.e. 30th St. #3
sweeper type: RVS

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

sample no. 5
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

sample no. 6
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

size, microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	29.1			33.8		
37	62.1	10.77778	38.23710	44.7	12.51852	44.41285
63	188.9	33.77778	119.8359	111.4	29.07407	103.1482
125	308.2	103.7407	368.0485	172.1	70.33333	249.5266
250	310.4	217.8889	773.0201	166.3	134.0741	475.6642
500	199.6	332.8519	1180.882	117.5	195.6667	694.1807
1000	116.8	406.7778	1443.155	87.3	239.1852	848.5745
2000	64.7	450.0370	1596.629	24.3	271.5185	963.2858
6300	29	474	1681.644	5.4	280.5185	995.2158
sieve sum	1308.8	484.7407	1719.750	762.8	282.5185	1002.311
total before sieving	1308.4	484.5926	1719.224	762.4	282.3704	1001.786

CASCADE IMPACTOR SAMPLES

c.i. cfm: .598
vac. cfm: 123
.0000131 curb-km
.0000082 curb-mi

c.i. cfm: .593
vac. cfm: 123
.0000130 curb-km
.0000081 curb-mi

size, aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.69			0		
0.4	.57	.0525641	.1864887	0	0	0
0.7	.95	.0959866	.3405447	.24	0	0
1.2	2.73	.1683575	.5973045	1.27	.0184373	.0654126
2	8.59	.3763285	1.335151	4.51	.1160015	.4115541
4	9.03	1.030713	3.656801	4.3	.4624696	1.640765
10	2.15	1.718618	6.097371	6.45	.7928049	2.812741
stage 1	19.19	1.882404	6.678459	14.09	1.288308	4.570704
precutter	3500.4	3.344296	11.86501	2542.08	2.370733	8.410967
total	3544.3	270.0043	957.9305	2572.94	197.6589	701.2610

project 80, run no. 4b hs date 3 Sep 82
half street sample, 16 ft. strips, Bellevue sampler
location:surrey down no. 2
sweeper type: BROOM

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL Rained Out
sample no.	7	none
strips	20	
cm wide	13.5	
curb-km	.0027	
curb-mi	.0016778	

size, microns	sieve wt., g	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi	sieve wt., g	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi
pan	18.5					
37	53.9	6.851852	24.30881			
63	94.2	26.81481	95.13285			
125	134.1	61.70370	218.9107			
250	170.9	111.3704	395.1167			
500	125.9	174.6667	619.6775			
1000	45.1	221.2963	785.1088			
2000	14	238	844.3697			
6300	8.7	243.1852	862.7656			
sieve sum	665.3	246.4074	874.1973			
total before sieving	664.3	246.0370	872.8833			

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.59	
vac. cfm:	123	
curb-km	.0000130	
curb-mi	.0000080	

size, aero.-microns	stage wt., mg	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi	stage wt., mg	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi
filter	.91					
0.4	.35	.0702637	.2492838			
0.7	.83	.0972881	.3451622			
1.2	2.16	.1613748	.5725310			
2	7.47	.3281544	1.164238			
4	7.24	.9049341	3.210556			
10	4.79	1.463955	5.193869			
stage 1	15.5	1.833804	6.506034			
precutter	1491.8	3.030603	10.75208			
total	1531.05	118.2167	419.4132			

project 80, run no. 5bhs date 8 Sep 82
half street sample, 16 ft. strips, Bellevue sampler
location:surrey down no. 1
sweeper type: BROOM

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 8	sample no. 9
20 strips	20 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0027 curb-km
.0016778 curb-mi	.0016778 curb-mi

size, microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	13			16.1		
37	20.1	4.814815	17.08187	19.1	5.962963	21.15523
63	41.9	12.25926	43.49306	40.6	13.03704	46.25244
125	67.6	27.77778	98.54922	63.4	28.07407	99.60041
250	88.1	52.81481	187.3749	88	51.55556	182.9074
500	76.3	85.44444	303.1374	76.6	84.14815	298.5384
1000	29	113.7037	403.3948	30	112.5185	399.1901
2000	9	124.4444	441.5005	11.1	123.6296	438.6097
6300	6.2	127.7778	453.3264	1	127.7407	453.1950
sieve sum	351.2	130.0741	461.4732	345.9	128.1111	454.5090
total before sieving	350.9	129.9630	461.0790	346.7	128.4074	455.5602

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .806	c.i. cfm: .788
vac. cfm: 123	vac. cfm: 123
.0000177 curb-km	.0000173 curb-km
.0000110 curb-mi	.0000107 curb-mi

size, aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	1.02			.2		
0.4	.71	.0576510	.2045360	.3	.0115623	.0410212
0.7	.68	.0977805	.3469092	.7	.0289058	.1025530
1.2	1.34	.1362145	.4832665	1.4	.0693739	.2461273
2	3.61	.2119520	.7519707	4	.1503102	.5332758
4	3.77	.4159912	1.475868	12.2	.3815567	1.353700
10	3.66	.6290736	2.231849	13.9	1.086858	3.855994
stage 1	10.77	.8359388	2.965773	26.4	1.890440	6.706968
precutter	941.7	1.444665	5.125433	902	3.416667	12.12177
total	967.26	54.67006	193.9603	961.1	55.56275	197.1274

project 80, run no. 6bhs date 10 Sep 82
half street sample, 15 ft. strips, Bellevue sampler
location:surrey down no. 3
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	sample no. 10	sample no. 11
	20 strips	20 strips
	13.5 cm wide	13.5 cm wide
	.0027 curb-km	.0027 curb-km
	.0016778 curb-mi	.0016778 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
size, microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	1.2			4.5		
37	1.8	.4444444	1.576788	5.3	1.666667	5.912953
63	4.5	1.111111	3.941969	8.6	3.629630	12.87710
125	11.4	2.777778	9.854922	12.1	6.814815	24.17741
250	24.9	7	24.83440	15.2	11.29630	40.07668
500	26.6	16.22222	57.55275	17.8	16.92593	60.04933
1000	11.1	26.07407	92.50487	7	23.51852	83.43834
2000	6	30.18519	107.0902	4.1	26.11111	92.63627
6300	1.9	32.40741	114.9741	1.3	27.62963	98.02363
sieve sum	89.4	33.11111	117.4707	75.9	28.11111	99.73181
total before sieving	89	32.96296	116.9451	75.3	27.88889	98.94342

CASCADE IMPACTOR SAMPLES

c.i. cfm:	.582	c.i. cfm: .608
vac. cfm:	123	vac. cfm: 123
	.0000128 curb-km	.0000133 curb-km
	.0000079 curb-mi	.0000083 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
size, aero.- microns		kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.4			0		
0.4	.3	.0313097	.1110815	.1	0	0
0.7	.1	.0547919	.1943926	.2	.0074927	.0265828
1.2	.2	.0626193	.2221630	.4	.0224781	.0797485
2	1	.0782742	.2777037	.5	.0524488	.1860798
4	.8	.1565483	.5554075	1.1	.0899123	.3189939
10	1.7	.2191676	.7775705	1.4	.1723319	.6114050
stage 1	4.4	.3522337	1.249667	3.3	.2772295	.9835645
precutter	138.7	.6966399	2.471563	60.7	.5244883	1.860798
total	147.6	11.55326	40.98907	67.7	5.072551	17.99657

project 80, run no. 7bhs date 10 Sep 82
half street sample, 16 ft. strips, Bellevue sampler
location:surrey downs # 2
sweeper type: ISS

	INITIAL	RESIDUAL
	VACUUM CLEANER SAMPLES	
sample no.	12	13
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

size, microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	30.4			28.1		
37	61.1	5.629630	19.97264	31.4	5.203704	18.46155
63	136.6	16.94444	60.11503	58.8	11.01852	39.09119
125	220	42.24074	149.8605	74.7	21.90741	77.72249
250	264.2	82.98148	294.3994	94.2	35.74074	126.8000
500	187.2	131.9074	467.9774	83.9	53.18519	188.6889
1000	71.6	166.5741	590.9668	37.9	68.72222	243.8108
2000	25	179.8333	638.0077	15.6	75.74074	268.7109
6300	7.9	184.4630	654.4325	11.8	78.62963	278.9600
sieve sum	1004	185.9259	659.6228	436.4	80.81481	286.7125
total before sieving	1004.7	186.0556	660.0827	436.2	80.77778	286.5811

	INITIAL	RESIDUAL
	CASCADE IMPACTOR SAMPLES	
c.i. cfm:	.613	.618
vac. cfm:	123	123
curb-km	.0000269	.0000271
curb-mi	.0000167	.0000169

size, aero.-microns		----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.3		
0.4	.1	0	0	.9	.0110572	.0392290
0.7	.3	.0037158	.0131830	.8	.0442287	.1569161
1.2	.9	.0148632	.0527320	1.1	.0737145	.2615268
2	1.9	.0483052	.1713790	2.7	.1142575	.4053666
4	3.6	.1189052	.4218560	2.6	.2137720	.7584278
10	2.5	.2526736	.8964440	3.5	.3096009	1.098413
stage 1	0	.3455682	1.226019	13.6	.4386012	1.556085
precutter	1284.2	.3455682	1.226019	1946.8	.9398598	3.334467
total	1293.5	48.06371	170.5221	1972.3	72.69355	257.9047

project 80, run no. 8hs date 13 Sep 82
half street sample, 16 ft. strips, Bellevue sampler
location:lake hills no. 5
sweeper type: BROOM

	INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	14	15
strips	20	20
cm wide	13.5	13.5
curb-km	.0027	.0027
curb-mi	.0016778	.0016778

size, microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	3.7			4.2		
37	5	1.370370	4.861762	6.1	1.555556	5.518756
63	12.7	3.222222	11.43171	16.3	3.814815	13.53409
125	36.9	7.925926	28.11938	40.6	9.851852	34.95212
250	99	21.59259	76.60560	67.2	24.88889	88.30010
500	118.3	58.25926	206.6906	48.1	49.77778	176.6002
1000	59.3	102.0741	362.1355	20.7	67.59259	239.8031
2000	60.5	124.0370	440.0551	21	75.25926	267.0027
6300	46.9	146.4444	519.5515	11.8	83.03704	294.5965
sieve sum	442.3	163.8148	581.1776	236	87.40741	310.1016
total before sieving	441.3	163.4444	579.8636	236.3	87.51852	310.4958

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.598	.582
vac. cfm:	115	115
curb-km	Only 10 \ .0000070	.0000137
curb-mi	strips / .0000044	.0000085

size, aero.-microns		----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.4	.02	.0142450	.0505390	.1	0	0
0.7	.12	.0170940	.0606467	.2	.0073183	.0259642
1.2	.24	.0341880	.1212935	.7	.0219549	.0778925
2	.44	.0683761	.2425870	.6	.0731831	.2596417
4	.86	.1310541	.4649584	1.7	.1170930	.4154267
10	1.59	.2535613	.8995934	2	.2415044	.8568176
stage 1	4.99	.4800570	1.703163	5.2	.3878707	1.376101
precutter	939.3	1.190883	4.225057	369.6	.7684231	2.726238
total	947.66	134.9943	478.9375	380.1	27.81691	98.68981

project 80, run no. 9hs date 14 Sep 82
Half Street samples, 15 ft. strips, Bellevue sampler
location:Surrey Downs #5
sweeper type: broom

INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 17	sample no. 19
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	9.6			13.8		
37	16.1	1.777778	6.307150	17.3	2.555556	9.066529
63	37.2	4.759259	16.88477	38.8	5.759259	20.43254
125	62.4	11.64815	41.32497	65.4	12.94444	45.92394
250	90.8	23.20370	82.32145	93	25.05556	88.89140
500	91.5	40.01852	141.9766	85.3	42.27778	149.9919
1000	45.2	56.96296	202.0916	36.5	58.07407	206.0336
2000	28.1	65.33333	231.7878	18.8	64.83333	230.0139
6300	7.7	70.53704	250.2493	6	68.31481	242.3654
sieve sum	388.6	71.96296	255.3082	374.9	69.42593	246.3074
total before sieving	388.1	71.87037	254.9797	375	69.44444	246.3731

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .582	c.i. cfm: .582
vac. cfm: 115	vac. cfm: 115
.0000273 curb-km	.0000273 curb-km
.0000170 curb-mi	.0000170 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.4	.2	.0036592	.0129821	.2	0	0
0.7	.2	.0109775	.0389463	.5	.0073183	.0259642
1.2	.4	.0182958	.0649104	.6	.0256141	.0908746
2	1.6	.0329324	.1168388	1	.0475690	.1687671
4	2.9	.0914789	.3245521	2.4	.0841606	.2985880
10	9.7	.1975945	.7010326	8.6	.1719804	.6101580
stage 1	12.2	.5525328	1.960295	12.1	.4866679	1.726617
precutter	1172.8	.9989500	3.544109	998.3	.9294260	3.297450
total	1200.1	43.91355	155.7980	1023.7	37.45879	132.8976

```
project 80,  run no.       10hs      date 14 Sep 82
Half Street samples,                15 ft. strips, Bellevue sampler
location:surrey downs #6
sweeper type:     ISS


                   INITIAL                             RESIDUAL

                           VACUUM CLEANER SAMPLES
                  sample no.        21            sample no.        23
                          40 strips                        40 strips
                        13.5 cm wide                     13.5 cm wide
                       .0054 curb-km                    .0054 curb-km
                    .0033556 curb-mi                 .0033556 curb-mi

                   ----cumulative----               ----cumulative----
            sieve  ---smaller than---        sieve  ---smaller than---
dia.,        wt.,  kg/       lb/              wt.,  kg/       lb/
microns       g      curb-km  curb-mi          g      curb-km  curb-mi

pan          10.6                             9.8
37           12.8 1.962963 6.964145           8.1 1.814815 6.438549
63           27.8 4.333333 15.37368          13.5 3.314815 11.76021
125          49.7 9.481481 33.63813          19.6 5.814815 20.62964
250          83.5 18.68519 66.29078            28 9.444444 33.50674
500          93.5 34.14815 121.1498          34.1 14.62963 51.90259
1000           57 51.46296 182.5789            21 20.94444 74.30611
2000         24.4 62.01852 220.0276          11.3 24.83333 88.10301
6300          9.3 66.53704 236.0582            .4 26.92593 95.52705
sieve sum   368.6 68.25926 242.1683         145.8       27 95.78984
total       368.2 68.18519 241.9055         145.3 26.90741 95.46135
 before
 sieving
                          CASCADE IMPACTOR SAMPLES
                  c.i. cfm:     .587              c.i. cfm:     .587
                  vac. cfm:      115              vac. cfm:      115
                   .0000276 curb-km                .0000276 curb-km
                   .0000171 curb-mi                .0000171 curb-mi

                  ----cumulative----              ----cumulative----
dia.,       stage ---smaller than---       stage  ---smaller than---
aero.-       wt., kg/       lb/             wt.,  kg/       lb/
microns       mg    curb-km  curb-mi         mg     curb-km  curb-mi

filter         .2                            .2
0.4            .2 .0072560 .0257430          .1 .0072560 .0257430
0.7            .5 .0145120 .0514860          .3 .0108840 .0386145
1.2            .9 .0326519 .1158435          .9 .0217679 .0772290
2             1.6 .0653038 .2316871         1.3 .0544198 .1930726
4             3.9 .1233516 .4376312         1.9 .1015837 .3604022
10            6.6 .2648432 .9396199           2 .1705155 .6049608
stage 1       8.7 .5042905 1.789139         6.9 .2430753 .8623909
precutter  1068.7 .8199255 2.908960       346.4 .4934065 1.750525
total      1091.3 39.59225 140.4667         360 13.06076 46.33742
```

project 80, run no. 11hs date 15 Sep 82
Half Street samples, 15 ft. strips, Bellevue sampler
location:surrey downs #4
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 25	sample no. 27
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	21.1			15.9		
37	16.3	3.907407	13.86259	15.8	2.944444	10.44622
63	46	6.925926	24.57161	29.5	5.870370	20.82674
125	60.9	15.44444	54.79337	38.2	11.33333	40.20808
250	81.5	26.72222	94.80435	39.8	18.40741	65.30529
500	75.9	41.81481	148.3494	30.4	25.77778	91.45368
1000	39.5	55.87037	198.2153	14.9	31.40741	111.4263
2000	21.7	63.18519	224.1666	12.4	34.16667	121.2155
6300	3.2	67.20370	238.4234	1.1	36.46296	129.3623
sieve sum	366.1	67.79630	240.5258	198	36.66667	130.0850
total before sieving	365.3	67.64815	240.0002	196.9	36.46296	129.3623

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .585	c.i. cfm: .594
vac. cfm: 115	vac. cfm: 115
.0000275 curb-km	.0000279 curb-km
.0000171 curb-mi	.0000173 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.4	.1	.0036404	.0129155	.2	0	0
0.7	.5	.0072808	.0258310	.4	.0071705	.0254396
1.2	.6	.0254827	.0904086	.5	.0215114	.0763189
2	1.6	.0473251	.1679016	1.1	.0394376	.1399180
4	3.1	.1055714	.3745498	1.9	.0788752	.2798361
10	6.4	.2184236	.7749306	4.6	.1469946	.5215127
stage 1	14.5	.4514087	1.601523	12.9	.3119155	1.106624
precutter	1133.2	.9792656	3.474272	610.3	.7744108	2.747481
total	1160.1	42.23219	149.8328	631.9	22.65510	80.37655

project 80, run no. 12hs date 16 Sep 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S.E. 30th st., #2
sweeper type: BROOM

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 28	sample no. 29
20 strips	20 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0027 curb-km
.0016778 curb-mi	.0016778 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	76.9			51.6		
37	75.6	28.48148	101.0458	46.4	19.11111	67.80187
63	232.3	56.48148	200.3834	130.2	36.29630	128.7710
125	295.8	142.5185	505.6232	167.7	84.51852	299.8524
250	300.7	252.0741	894.3013	182.3	146.6296	520.2085
500	247.1	363.4444	1289.418	160.1	214.1481	759.7488
1000	112.7	454.9630	1614.105	75.1	273.4444	970.1186
2000	61.9	496.7037	1762.192	34.9	301.2593	1068.799
6300	13.2	519.6296	1843.527	17.2	314.1852	1114.657
sieve sum	1416.2	524.5185	1860.872	865.5	320.5556	1137.258
total before sieving	1415.9	524.4074	1860.478	864	320	1135.287

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .596	c.i. cfm: .584
vac. cfm: 110	vac. cfm: 110
.0000146 curb-km	.0000143 curb-km
.0000091 curb-mi	.0000089 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	1.4			.1		
0.4	.7	.0956997	.3395268	.3	.0069762	.0247502
0.7	1.1	.1435496	.5092902	1.1	.0279046	.0990010
1.2	4	.2187422	.7760613	3	.1046423	.3712536
2	14.2	.4921700	1.746138	7.9	.3139269	1.113761
4	14	1.462839	5.189910	17.6	.8650431	3.069030
10	6.6	2.419836	8.585178	5.4	2.092846	7.425072
stage 1	49	2.870992	10.18580	29.3	2.469559	8.761585
precutter	4537.7	6.220482	22.06924	2740.9	4.513572	16.01341
total	4628.7	316.4038	1122.548	2805.6	195.7230	694.3928

project 80, run no. 13hs date 16 Sep 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S.E. 30th st., #1
sweeper type: RVS

	INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 30	sample no. 31
20 strips	20 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0027 curb-km
.0016778 curb-mi	.0016778 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	65.5			26.3		
37	58.8	24.25926	86.06632	32	9.740741	34.55793
63	153.9	46.03704	163.3289	71.8	21.59259	76.60560
125	275.5	103.0370	365.5519	80.8	48.18519	170.9501
250	242	205.0741	727.5561	72.3	78.11111	277.1204
500	170.8	294.7037	1045.542	67.7	104.8889	372.1219
1000	108.6	357.9630	1269.971	49.4	129.9630	461.0790
2000	104.3	398.1852	1412.670	29.4	148.2593	525.9901
6300	36.4	436.8148	1549.719	9.5	159.1481	564.6213
sieve sum	1215.8	450.2963	1597.549	439.2	162.6667	577.1042
total before sieving	1214.4	449.7778	1595.709	438.7	162.4815	576.4473

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .612	c.i. cfm: .597
vac. cfm: 110	vac. cfm: 110
.0000150 curb-km	.0000147 curb-km
.0000093 curb-mi	.0000091 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.1		
0.4	.2	0	0	.2	.0068242	.0242113
0.7	.7	.0133140	.0472358	.5	.0204727	.0726339
1.2	2.1	.0599129	.2125609	1.5	.0545940	.1936903
2	5.8	.1997095	.7085363	2.3	.1569576	.5568597
4	11.8	.5858146	2.078373	4.8	.3139153	1.113719
10	19.9	1.371339	4.865283	4.8	.6414790	2.275861
stage 1	31	2.696078	9.565240	12.7	.9690427	3.438003
precutter	3697	4.759743	16.88678	1179.6	1.835722	6.512837
total	3768.5	250.8684	890.0397	1206.5	82.33451	292.1092

project 80, run no. 14hs date 16 Sep 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S.E. 30th st., #3
sweeper type: ISS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	32	33
strips	20	20
cm wide	13.5	13.5
curb-km	.0027	.0027
curb-mi	.0016778	.0016778

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	18.5			25.8		
37	34.5	6.851852	24.30881	26.7	9.555556	33.90093
63	102.9	19.62963	69.64145	57.4	19.44444	68.98446
125	147.5	57.74074	204.8510	58.7	40.70370	144.4075
250	170.6	112.3704	398.6645	57.3	62.44444	221.5387
500	154.5	175.5556	622.8311	62.8	83.66667	296.8303
1000	98.1	232.7778	825.8425	51.3	106.9259	379.3488
2000	37.7	269.1111	954.7449	14.1	125.9259	446.7565
6300	13.2	283.0741	1004.282	4.8	131.1481	465.2837
sieve sum	777.5	287.9630	1021.627	358.9	132.9259	471.5909
total before sieving	777.3	287.8889	1021.364	359.6	133.1852	472.5107

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.61	.61
vac. cfm:	110	110
curb-km	.0000150	.0000150
curb-mi	.0000093	.0000093

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.1		
0.4	.3	0	0	.1	.0066788	.0236953
0.7	.5	.0200364	.0710859	.4	.0133576	.0473906
1.2	.6	.0534305	.1895625	1.2	.0400729	.1421719
2	2.5	.0935033	.3317344	2.7	.1202186	.4265156
4	5.1	.2604736	.9241172	3.6	.3005464	1.066289
10	9.9	.6010929	2.132578	3.3	.5409836	1.919320
stage 1	8.2	1.262295	4.478414	12.5	.7613843	2.701266
precutter	864.5	1.809957	6.421430	2222.5	1.596236	5.663180
total	891.6	59.54827	211.2674	2246.4	150.0328	532.2915

project 80, run no. 15hs date 17 Sep 82
Half Street samples, 16 ft. strips, Bellevue sampler
location:surrey downs #6
sweeper type: broom

	INITIAL		RESIDUAL	
		VACUUM CLEANER SAMPLES		
sample no.	35		sample no.	37
40	strips		40	strips
13.5	cm wide		13.5	cm wide
.0054	curb-km		.0054	curb-km
.0033556	curb-mi		.0033556	curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	8			8.8		
37	7.3	1.481481	5.255959	7.9	1.629630	5.781554
63	12	2.833333	10.05202	16.7	3.092593	10.97181
125	15.7	5.055556	17.93596	25.7	6.185185	21.94363
250	22.2	7.962963	28.25078	35.7	10.94444	38.82839
500	29.7	12.07407	42.83606	37.7	17.55556	62.28311
1000	17.8	17.57407	62.34881	19.6	24.53704	87.05181
2000	9.2	20.87037	74.04332	9.7	28.16667	99.92891
6300	2.2	22.57407	80.08767	4.8	29.96296	106.3018
sieve sum	124.1	22.98148	81.53306	166.6	30.85185	109.4553
total before sieving	123.5	22.87037	81.13886	166	30.74074	109.0611

		CASCADE IMPACTOR SAMPLES		
c.i. cfm:	.596		c.i. cfm:	.593
vac. cfm:	110		vac. cfm:	110
.0000293	curb-km		.0000291	curb-km
.0000182	curb-mi		.0000181	curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.3			0		
0.4	.2	.0102535	.0363779	.1	0	0
0.7	.3	.0170892	.0606298	.2	.0034351	.0121873
1.2	.3	.0273428	.0970077	.6	.0103054	.0365619
2	.8	.0375963	.1333855	1.1	.0309162	.1096857
4	1	.0649391	.2303932	1.3	.0687028	.2437461
10	2.1	.0991176	.3516528	2.7	.1133596	.4021810
stage 1	4	.1708924	.6062979	6.3	.2061083	.7312382
precutter	273.8	.3076063	1.091336	376.4	.4225220	1.499038
total	282.8	9.665672	34.29221	388.7	13.35238	47.37205

project 80, run no. 16hs date 21 Sep 82
Half Street samples, 15 ft. strips, Bellevue sampler
location:surrey downs #4
sweeper type: ISS

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 44	sample no. 45
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	11.3			11.8		
37	14.9	2.092593	7.424041	12.4	2.185185	7.752539
63	38.1	4.851852	17.21326	24	4.481481	15.89927
125	45.1	11.90741	42.24477	28.2	8.925926	31.66715
250	50.1	20.25926	71.87523	27	14.14815	50.19440
500	37.8	29.53704	104.7907	21.8	19.14815	67.93326
1000	23.9	36.53704	129.6251	15.2	23.18519	82.25575
2000	9.7	40.96296	145.3273	4.7	26.00000	92.24207
6300	3.2	42.75926	151.7001	1	26.87037	95.32995
sieve sum	234.1	43.35185	153.8025	146.1	27.05556	95.98694
total before sieving	233.4	43.22222	153.3426	145.7	26.98148	95.72415

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .547	c.i. cfm: .571
vac. cfm: 110	vac. cfm: 110
.0000269 curb-km	.0000280 curb-km
.0000167 curb-mi	.0000174 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	1			.5		
0.4	.8	.0372402	.1321219	.3	.0178375	.0632843
0.7	.2	.0670323	.2378195	.3	.0285399	.1012549
1.2	.5	.0744803	.2642439	.3	.0392424	.1392255
2	1.6	.0931004	.3303049	1.3	.0499449	.1771961
4	2.7	.1526847	.5417000	.8	.0963222	.3417354
10	4.3	.2532331	.8984292	1.9	.1248622	.4429903
stage 1	8.8	.4133658	1.466554	6.8	.1926445	.6834708
precutter	383.3	.7410793	2.629227	339.9	.4352338	1.544138
total	403.2	15.01523	53.27157	352.1	12.56113	44.56483

project 80, run no. 17hs date 21 Sep 82
Half Street samples, 15 ft. strips, Bellevue sampler
location:surrey downs #5
sweeper type: RVS

	INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 38	sample no. 39
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	12.9			7.8		
37	15.6	2.388889	8.475233	10.1	1.444444	5.124560
63	41.5	5.277778	18.72435	21.3	3.314815	11.76021
125	67.8	12.96296	45.98964	27.8	7.259259	25.75420
250	103.5	25.51852	90.53389	33.5	12.40741	44.01865
500	102.5	44.68519	158.5329	35.9	18.61111	66.02798
1000	46.4	63.66667	225.8748	19.3	25.25926	89.61409
2000	26.3	72.25926	256.3594	10	28.83333	102.2941
6300	10.6	77.12963	273.6383	.7	30.68519	108.8640
sieve sum	427.1	79.09259	280.6025	166.4	30.81481	109.3239
total before sieving	426.2	78.92593	280.0112	170.7	31.61111	112.1490

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .526	c.i. cfm: .559
vac. cfm: 110	vac. cfm: 110
.0000258 curb-km	.0000274 curb-km
.0000160 curb-mi	.0000171 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.5			.1		
0.4	.3	.0193635	.0686984	.2	.0036441	.0129286
0.7	.1	.0309816	.1099174	.5	.0109322	.0387857
1.2	.4	.0348542	.1236571	.5	.0291526	.1034286
2	.5	.0503450	.1786158	1.1	.0473730	.1680714
4	.8	.0697085	.2473142	1.9	.0874578	.3102857
10	2.7	.1006900	.3572316	2.6	.1566952	.5559285
stage 1	7.1	.2052528	.7282029	6.8	.2514411	.8920713
precutter	756.8	.4802141	1.703720	405.99	.4992381	1.771214
total	769.2	29.78876	105.6856	419.69	15.29381	54.25991

project 80, run no. 18hs date 22 Sep 82
Half Street samples, 16 ft. strips, Bellevue sampler
location:surrey downs #2
sweeper type: broom

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	46	47
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	13.6			16.1		
37	23.4	2.518519	8.935130	22.1	2.981481	10.57762
63	58.5	6.851852	24.30881	46.4	7.074074	25.09720
125	81.4	17.68519	62.74301	61.5	15.66667	55.58176
250	95.6	32.75926	116.2224	74.7	27.05556	95.98694
500	78.1	50.46296	179.0311	65.8	40.88889	145.0645
1000	39.6	64.92593	230.3424	34.1	53.07407	188.2947
2000	25.1	72.25926	256.3594	15	59.38889	210.6982
6300	13.3	76.90741	272.8499	3.2	62.16667	220.5532
sieve sum	428.6	79.37037	281.5880	338.9	62.75926	222.6555
total before sieving	427.7	79.20370	280.9967	338.6	62.70370	222.4584

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.582	.588
vac. cfm:	110	110
curb-km	.0000286	.0000289
curb-mi	.0000178	.0000179

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.1			.1		
0.4	.2	.0035001	.0124176	0	.0034643	.0122909
0.7	.1	.0105002	.0372529	.2	.0034643	.0122909
1.2	.8	.0140003	.0496706	.3	.0103930	.0368728
2	1.6	.0420008	.1490118	1.1	.0207861	.0737456
4	2.8	.0980018	.3476941	1.9	.0588939	.2089459
10	3.7	.1960036	.6953882	1.9	.1247166	.4424737
stage 1	8.8	.3255059	1.154841	6.5	.1905392	.6760015
precutter	1073.7	.6335115	2.247594	860.1	.4157218	1.474912
total	1091.8	38.21369	135.5759	872.1	30.21259	107.1893

```
project 80,  run no.       19hs      date 23 Sep 82
Half Street samples,                15 ft. strips, Bellevue sampler
location:surrey downs #3
sweeper type:      ISS


                    INITIAL                            RESIDUAL

                              VACUUM CLEANER SAMPLES
                   sample no.        50             sample no.        52
                           40 strips                        40 strips
                         13.5 cm wide                     13.5 cm wide
                        .0054 curb-km                    .0054 curb-km
                     .0033556 curb-mi                 .0033556 curb-mi

                     ----cumulative----               ----cumulative----
             sieve   ---smaller than---      sieve    ---smaller than---
dia.,          wt.,  kg/        lb/            wt.,   kg/        lb/
microns         g      curb-km  curb-mi         g       curb-km  curb-mi

pan           10.5                            7.9
37            12.8 1.944444 6.898446          8.9 1.462963 5.190259
63            24.3 4.314815 15.30798         15.1 3.111111 11.03751
125           30.5 8.814815 31.27295         18.4 5.907407 20.95813
250           33.4 14.46296 51.31130         18.5 9.314815 33.04684
500           24.6 20.64815 73.25492         15.8 12.74074 45.20124
1000          13.9 25.20370 89.41699          8.9 15.66667 55.58176
2000          10.3 27.77778 98.54922          7.6 17.31481 61.42902
6300           5.4 29.68519 105.3163          1.2 18.72222 66.42218
sieve sum    165.7 30.68519 108.8640        102.3 18.94444 67.21057
total        165.8 30.70370 108.9297        101.6 18.81481 66.75067
 before
 sieving
                             CASCADE IMPACTOR SAMPLES
                    c.i. cfm:      .585          c.i. cfm:      .585
                    vac. cfm:       110          vac. cfm:       110
                     .0000287 curb-km             .0000287 curb-km
                     .0000178 curb-mi             .0000178 curb-mi

                    ----cumulative----            ----cumulative----
dia.,         stage ---smaller than---      stage ---smaller than---
aero.-         wt., kg/        lb/           wt., kg/        lb/
microns         mg    curb-km  curb-mi        mg    curb-km  curb-mi

filter          .6                             0
0.4             .1 .0208927 .0741238          .1        0        0
0.7             .4 .0243748 .0864778          .1 .0034821 .0123540
1.2             .5 .0383033 .1358936          .4 .0069642 .0247079
2              1.5 .0557138 .1976635           1 .0208927 .0741238
4              1.4 .1079456 .3829730         1.5 .0557138 .1976635
10             2.9 .1566952 .5559285         1.6 .1079456 .3829730
stage 1        7.8 .2576765 .9141935         6.2 .1636594 .5806364
precutter    475.1 .5292814 1.877803      189.36 .3795505 1.346582
total        490.3 17.07281 60.57150      200.26 6.973283 24.74005
```

```
project 80,  run no.      20hs     date 23 Sep 82
Half Street samples,                16 ft. strips, Bellevue sampler
location:surrey downs #1
sweeper type:     RVS


                    INITIAL                             RESIDUAL

                               VACUUM CLEANER SAMPLES
                   sample no.        55              sample no.        57
                            40 strips                         40 strips
                          13.5 cm wide                      13.5 cm wide
                         .0054 curb-km                     .0054 curb-km
                     .0033556 curb-mi                  .0033556 curb-mi

                      ----cumulative----                ----cumulative----
               sieve  ---smaller than---       sieve    ---smaller than---
dia.,           wt.,  kg/        lb/            wt.,    kg/        lb/
microns          g      curb-km  curb-mi         g        curb-km  curb-mi

pan             18.4                           14.3
37              25.6 3.407407 12.08870         21.3 2.648148 9.395026
63              61.4 8.148148 28.90777         41.5 6.592593 23.38902
125            113.5 19.51852 69.24725         58.1 14.27778 50.65430
250            175.3 40.53704 143.8162         73.9 25.03704 88.82570
500            170.1       73 258.9874         81.1 38.72222 137.3776
1000            72.1    104.5 370.7422         36.9 53.74074 190.6599
2000            28.9 117.8519 418.1115         12.5 60.57407 214.9030
6300             4.6 123.2037 437.0987          3.4 62.88889 223.1154
sieve sum      669.9 124.0556 440.1208          343 63.51852 225.3492
total          669.3 123.9444 439.7266        343.1 63.53704 225.4149
 before
 sieving
                               CASCADE IMPACTOR SAMPLES
                  c.i. cfm:      .594            c.i. cfm:      .586
                  vac. cfm:       110            vac. cfm:       110
                   .0000292 curb-km               .0000288 curb-km
                   .0000181 curb-mi               .0000179 curb-mi

                      ----cumulative----               ----cumulative----
dia.,          stage  ---smaller than---             ---smaller than---
aero.-          wt.,  kg/        lb/         stage   kg/        lb/
microns          mg     curb-km  curb-mi      wt.,
                                               mg       curb-km  curb-mi

filter            .1                            0
0.4                0 .0034294 .0121668          0        0        0
0.7               .1 .0034294 .0121668         .1        0        0
1.2               .8 .0068587 .0243336         .2 .0034762 .0123329
2                1.9 .0342936 .1216679        1.4 .0104285 .0369987
4                3.7 .0994513 .3528368        2.7 .0590949 .2096590
10               2.7 .2263374 .8030078        3.6 .1529516 .5426469
stage 1         11.9 .3189300 1.131511       11.4 .2780938 .9866308
precutter     1333.6 .7270233 2.579358      944.9 .6743774 2.392580
total         1354.8 46.46091 164.8356      964.3 33.52073 118.9260
```

project 80, run no. 21hs date 27 Sep 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S.E. 30th no. 3
sweeper type: broom

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 58	sample no. 60
20 strips	20 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0027 curb-km
.0016778 curb-mi	.0016778 curb-mi

		----cumulative----			----cumulative----	
		---smaller than---			---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	5.3			18.8		
37	16	1.962963	6.964145	35.7	6.962963	24.70301
63	56.9	7.888889	27.98798	96.4	20.18519	71.61244
125	91.9	28.96296	102.7540	170.4	55.88889	198.2810
250	105.8	63	223.5096	175.8	119	422.1849
500	96.3	102.1852	362.5297	112.3	184.1111	653.1842
1000	64.3	137.8519	489.0669	57.8	225.7037	800.7453
2000	24.8	161.6667	573.5565	21.8	247.1111	876.6939
6300	.9	170.8519	606.1434	11	255.1852	905.3389
sieve sum	462.2	171.1852	607.3260	700	259.2593	919.7927
total before sieving	461.4	170.8889	606.2748	699.4	259.0370	919.0044

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .56	c.i. cfm: .562
vac. cfm: 105	vac. cfm: 105
.0000144 curb-km	.0000145 curb-km
.0000089 curb-mi	.0000090 curb-mi

		----cumulative----			----cumulative----	
		---smaller than---			---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.2			0		
0.4	.2	.0138889	.0492755	.1	0	0
0.7	.3	.0277778	.0985510	.2	.0069197	.0245501
1.2	.4	.0486111	.1724642	.7	.0207592	.0736502
2	.9	.0763889	.2710151	1.5	.0691973	.2455006
4	1.2	.1388889	.4927548	2.4	.1729933	.6137515
10	17.2	.2222222	.7884077	3.2	.3390668	1.202953
stage 1	3.9	1.416667	5.026099	6.9	.5604982	1.988555
precutter	576.7	1.687500	5.986971	960.7	1.037960	3.682509
total	601	41.73611	148.0728	975.7	67.51582	239.5349

project 80, run no. 22hs date 27 Sep 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S.E. 30th St. #2
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	62	64
strips	20	20
cm wide	13.5	13.5
curb-km	.0027	.0027
curb-mi	.0016778	.0016778

		----cumulative----			----cumulative----	
		---smaller than---			---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	11.2			10		
37	36.6	4.148148	14.71668	26.7	3.703704	13.13990
63	116.4	17.70370	62.80870	65.2	13.59259	48.22342
125	189.3	60.81481	215.7571	97.6	37.74074	133.8955
250	221.8	130.9259	464.4953	104.5	73.88889	262.1409
500	174.1	213.0741	755.9382	114.4	112.5926	399.4529
1000	92.1	277.5556	984.7038	65.3	154.9630	549.7733
2000	56	311.6667	1105.722	22.5	179.1481	635.5768
6300	14	332.4074	1179.306	5.3	187.4815	665.1416
sieve sum	911.5	337.5926	1197.702	511.5	189.4444	672.1057
total before sieving	909.9	337	1195.599	511	189.2593	671.4487

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.568	.568
vac. cfm:	105	105
curb-km	.0000146	.0000146
curb-mi	.0000091	.0000091

		----cumulative----			----cumulative----	
		---smaller than---			---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.3			0		
0.4	.2	.0205399	.0728722	.1	0	0
0.7	.3	.0342332	.1214536	.2	.0068466	.0242907
1.2	.8	.0547731	.1943258	.5	.0205399	.0728722
2	1.9	.1095462	.3886517	1.3	.0547731	.1943258
4	3.1	.2396322	.8501755	1.5	.1437793	.5101053
10	2.9	.4518779	1.603188	1.5	.2464789	.8744663
stage 1	5.2	.6504304	2.307619	4.7	.3491784	1.238827
precutter	2190.8	1.006455	3.570737	1313.6	.6709703	2.380492
total	2205.5	151.0025	535.7320	1323.4	90.60837	321.4635

project 80, run no. 23hs date 29 Sep 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S. E. 30th St. #1
sweeper type: ISS

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 66	sample no. 68
20 strips	20 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0027 curb-km
.0016778 curb-mi	.0016778 curb-mi

dia., microns	INITIAL sieve wt., g	INITIAL cumulative smaller than kg/curb-km	INITIAL cumulative smaller than lb/curb-mi	RESIDUAL sieve wt., g	RESIDUAL cumulative smaller than kg/curb-km	RESIDUAL cumulative smaller than lb/curb-mi
pan	3.6			2.1		
37	9	1.333333	4.730363	3.9	.7777778	2.759378
63	36.6	4.666667	16.55627	12.9	2.222222	7.883938
125	78.4	18.22222	64.64829	23.8	7	24.83440
250	100.9	47.25926	167.6651	30.5	15.81481	56.10736
500	89.8	84.62963	300.2466	33.7	27.11111	96.18404
1000	50	117.8889	418.2429	25.4	39.59259	140.4655
2000	29	136.4074	483.9424	10.7	49.00000	173.8408
6300	5.2	147.1481	522.0481	1.1	52.96296	187.9005
sieve sum	402.5	149.0741	528.8808	144.1	53.37037	189.3459
total before sieving	401.5	148.7037	527.5668	143.4	53.11111	188.4261

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .537	c.i. cfm: .537
vac. cfm: 105	vac. cfm: 105
.0000138 curb-km	.0000138 curb-km
.0000086 curb-mi	.0000086 curb-mi

dia., aero.-microns	INITIAL stage wt., mg	INITIAL cumulative smaller than kg/curb-km	INITIAL cumulative smaller than lb/curb-mi	RESIDUAL stage wt., mg	RESIDUAL cumulative smaller than kg/curb-km	RESIDUAL cumulative smaller than lb/curb-mi
filter	.2			.6		
0.4	.2	.0144838	.0513860	.2	.0434513	.1541579
0.7	.1	.0289675	.1027720	.2	.0579350	.2055439
1.2	.2	.0362094	.1284649	.4	.0724188	.2569299
2	.4	.0506932	.1798509	.3	.1013863	.3597018
4	.7	.0796607	.2826229	.3	.1231119	.4367808
10	.7	.1303538	.4624738	.4	.1448376	.5138598
stage 1	2.9	.1810470	.6423247	2.2	.1738051	.6166317
precutter	998.3	.3910615	1.387421	341.7	.3331264	1.181877
total	1003.7	72.68674	257.8805	346.3	25.07863	88.97482

project 80, run no. 24hs date 30 Sep 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S. E. 30th St. #2
sweeper type: broom

	INITIAL	RESIDUAL
	VACUUM CLEANER SAMPLES	
sample no.	70	72
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	29.8			17.4		
37	84.9	5.518519	19.57845	37.3	3.222222	11.43171
63	216.5	21.24074	75.35731	107.4	10.12963	35.93762
125	284.6	61.33333	217.5967	187.1	30.01852	106.4989
250	268.2	114.0370	404.5774	221.9	64.66667	229.4226
500	211.8	163.7037	580.7834	194.7	105.7593	375.2097
1000	104.7	202.9259	719.9349	104.7	141.8148	503.1266
2000	52.2	222.3148	788.7223	55.8	161.2037	571.9140
6300	14.2	231.9815	823.0174	13	171.5370	608.5743
sieve sum	1266.9	234.6111	832.3467	939.3	173.9444	617.1152
total before sieving	1265.2	234.2963	831.2298	938.9	173.8704	616.8524

	INITIAL	RESIDUAL
	CASCADE IMPACTOR SAMPLES	
c.i. cfm:	.559	.564
vac. cfm:	105	105
curb-km	.0000287	.0000290
curb-mi	.0000179	.0000180

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.2			0		
0.4	.1	.0069569	.0246818	.2	0	0
0.7	.6	.0104353	.0370227	.2	.0068952	.0244630
1.2	1.7	.0313059	.1110682	.5	.0137904	.0489260
2	4.1	.0904393	.3208636	1.4	.0310284	.1100835
4	6.8	.2330551	.8268408	1.9	.0792947	.2813246
10	2.6	.4695886	1.666023	2.3	.1447991	.5137231
stage 1	11.4	.5600278	1.986886	4.9	.2240938	.7950476
precutter	2719.3	.9565693	3.393750	1880.2	.3930260	1.394391
total	2746.8	95.54562	338.9800	1891.6	65.21474	231.3711

project 80, run no. 25hs date 30 Sep 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S. E. 30th St. #3
sweeper type: ISS

INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 74	sample no. 76
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	9			9.5		
37	34.5	1.666667	5.912953	14.6	1.759259	6.241451
63	138.6	8.055556	28.57927	40.4	4.462963	15.83358
125	287.2	33.72222	119.6388	58.2	11.94444	42.37617
250	316.1	86.90741	308.3277	84.8	22.72222	80.61326
500	205	145.4444	516.0037	129.3	38.42593	136.3264
1000	112.9	183.4074	650.6877	108.3	62.37037	221.2759
2000	48.6	204.3148	724.8624	31.2	82.42593	292.4284
6300	12	213.3148	756.7923	10.4	88.20370	312.9266
sieve sum	1163.9	215.5370	764.6763	486.7	90.12963	319.7594
total before sieving	1163	215.3704	764.0850	485.3	89.87037	318.8396

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .542	c.i. cfm: .531
vac. cfm: 105	vac. cfm: 105
.0000279 curb-km	.0000273 curb-km
.0000173 curb-mi	.0000170 curb-mi

dia., aero.- microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.5			0		
0.4	.2	.0179377	.0636399	.2	0	0
0.7	.6	.0251128	.0890959	.3	.0073237	.0259833
1.2	1.1	.0466380	.1654638	.7	.0183093	.0649583
2	2.9	.0861009	.3054716	1	.0439422	.1558998
4	2.2	.1901394	.6745831	1.1	.0805608	.2858163
10	.7	.2690652	.9545988	.4	.1208412	.4287245
stage 1	9.1	.2941779	1.043695	3.6	.1354886	.4806911
precutter	3102.2	.6206437	2.201941	1048.1	.2673153	.9483906
total	3119.5	111.9132	397.0495	1055.4	38.64721	137.1139

project 80, run no. 26hs date 1 Oct 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S. E. 30th St. #1
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 78	sample no. 80
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

		----cumulative----			----cumulative----	
		---smaller than---			---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	14.5			11		
37	26	2.685185	9.526425	16.9	2.037037	7.226943
63	67.1	7.5	26.60829	42.6	5.166667	18.33016
125	111	19.92593	70.69264	55.3	13.05556	46.31813
250	107.8	40.48148	143.6191	57.8	23.29630	82.64995
500	93.2	60.44444	214.4431	64.9	34	120.6242
1000	59.1	77.70370	275.6750	44.6	46.01852	163.2632
2000	41.7	88.64815	314.5034	19.1	54.27778	192.5652
6300	17.2	96.37037	341.9001	3.1	57.81481	205.1138
sieve sum	537.6	99.55556	353.2004	315.3	58.38889	207.1505
total before sieving	536.9	99.42593	352.7405	313.8	58.11111	206.1650

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .559	c.i. cfm: .56
vac. cfm: 105	vac. cfm: 105
.0000287 curb-km	.0000288 curb-km
.0000179 curb-mi	.0000179 curb-mi

		----cumulative----			----cumulative----	
		---smaller than---			---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.4			.3		
0.4	.1	.0139137	.0493636	.3	.0104167	.0369566
0.7	.2	.0173922	.0617045	.3	.0208333	.0739132
1.2	.4	.0243490	.0863864	.3	.0312500	.1108698
2	1.3	.0382628	.1357500	.5	.0416667	.1478264
4	1.2	.0834824	.2961818	1.3	.0590278	.2094208
10	1.2	.1252236	.4442727	1.5	.1041667	.3695661
stage 1	4.3	.1669648	.5923636	4.4	.15625	.5543492
precutter	1261.1	.3165375	1.123023	682.3	.3090278	1.096379
total	1270.2	44.18306	156.7542	691.2	24	85.14803

project 80, run no. 27hs date 4 Oct 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S. E. 30th St. #2
sweeper type: ISS

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	82	84
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
pan	12.4			11.7		
37	29.1	2.296296	8.146736	18.2	2.166667	7.686839
63	97.9	7.685185	27.26529	53.9	5.537037	19.64415
125	146	25.81481	91.58508	74.8	15.51852	55.05617
250	193	52.85185	187.5063	91.6	29.37037	104.1994
500	192.2	88.59259	314.3063	108.6	46.33333	164.3801
1000	96.2	124.1852	440.5807	64.8	66.44444	235.7297
2000	51.4	142	503.7836	28.4	78.44444	278.3030
6300	23.9	151.5185	537.5532	2.1	83.70370	296.9617
sieve sum	842.1	155.9444	553.2553	454.1	84.09259	298.3413
total before sieving	842	155.9259	553.1896	453.3	83.94444	297.8158

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.546	.52
vac. cfm:	105	105
curb-km	.0000281	.0000267
curb-mi	.0000174	.0000166

dia., aero.-microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
filter	.8			.1		
0.4	.4	.0284900	.1010779	.2	.0037393	.0132665
0.7	.6	.0427350	.1516169	.7	.0112179	.0397994
1.2	1.1	.0641026	.2274253	.4	.0373932	.1326648
2	1.9	.1032764	.3664074	1.3	.0523504	.1857307
4	1.7	.1709402	.6064675	2	.1009615	.3581948
10	1.8	.2314815	.8212580	1.5	.1757479	.6235244
stage 1	3.7	.2955840	1.048683	4.9	.2318376	.8225215
precutter	2432	.4273504	1.516169	1241.6	.4150641	1.472579
total	2444	87.03704	308.7930	1252.7	46.84241	166.1891

project 80, run no. 28hs date 4 Oct 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S. E. 30th St. #3
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	87	89
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	7.9			9.3		
37	21	1.462963	5.190259	19.5	1.722222	6.110052
63	75.3	5.351852	18.98715	53.5	5.333333	18.92145
125	125.4	19.29630	68.45886	71	15.24074	54.07067
250	127.9	42.51852	150.8460	69.8	28.38889	100.7173
500	108.1	66.20370	234.8756	72.6	41.31481	146.5755
1000	78.6	86.22222	305.8968	58.5	54.75926	194.2734
2000	43.6	100.7778	357.5366	31.4	65.59259	232.7076
6300	4.7	108.8519	386.1816	2.9	71.40741	253.3372
sieve sum	592.5	109.7222	389.2694	388.5	71.94444	255.2425
total before sieving	591.9	109.6111	388.8752	387.9	71.83333	254.8483

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.563	.565
vac. cfm:	105	105
curb-km	.0000290	.0000291
curb-mi	.0000180	.0000181

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.1			.2		
0.4	.2	.0034537	.0122532	.2	.0068830	.0244197
0.7	.3	.0103612	.0367597	.6	.0137660	.0488394
1.2	.5	.0207223	.0735194	.5	.0344149	.1220985
2	1.3	.0379909	.1347855	1.3	.0516224	.1831478
4	2.1	.0828893	.2940775	1.4	.0963618	.3418759
10	1.6	.1554174	.5513953	1	.1445428	.5128139
stage 1	4.9	.2106769	.7474469	3.1	.1789577	.6349124
precutter	516.4	.3799092	1.347855	785.9	.2856441	1.013418
total	527.4	18.21492	64.62352	794.2	27.33235	96.97066

project 80, run no. 29hs date 5 Oct 82
Half Street samples, 22.25 ft. strips, Bellevue sampler
location:S. E. 30th St. #1
sweeper type: broom

INITIAL | RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	91	93
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

	INITIAL	----cumulative----		RESIDUAL	----cumulative----	
		---smaller than---			---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	8			12.5		
37	13.5	1.481481	5.255959	20.1	2.314815	8.212435
63	42.1	3.981481	14.12539	49.9	6.037037	21.41803
125	75	11.77778	41.78487	83.9	15.27778	54.20207
250	85.5	25.66667	91.05948	100.6	30.81481	109.3239
500	83.5	41.5	147.2325	96.3	49.44444	175.4176
1000	53	56.96296	202.0916	61.2	67.27778	238.6862
2000	33.1	66.77778	236.9123	35.8	78.61111	278.8943
6300	8.5	72.90741	258.6589	8.1	85.24074	302.4147
sieve sum	402.2	74.48148	264.2433	468.4	86.74074	307.7364
total before sieving	402.2	74.48148	264.2433	468.1	86.68519	307.5393

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.553	.559
vac. cfm:	105	105
curb-km	.0000284	.0000287
curb-mi	.0000177	.0000179

	INITIAL	----cumulative----		RESIDUAL	----cumulative----	
		---smaller than---			---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.4			.1		
0.4	.1	.0140647	.0498992	.1	.0034784	.0123409
0.7	.2	.0175809	.0623740	.2	.0069569	.0246818
1.2	.7	.0246132	.0873236	.8	.0139137	.0493636
2	2.3	.0492264	.1746473	2.3	.0417412	.1480909
4	1.7	.1300985	.4615678	6.7	.1217452	.4319318
10	1.1	.1898734	.6736395	38.8	.3548002	1.258773
stage 1	5.8	.2285513	.8108623	20.5	1.704433	6.047045
precutter	364.9	.4324895	1.534401	658	2.417511	8.576931
total	377.2	13.26301	47.05497	727.5	25.30561	89.78010

APPENDIX C -- BELLEVUE SWEEPING LANE DATA

project 80, run no. 9sl date 14 Sep 82
swept lane samples, 10 ft. strips, Bellevue sampler
location:Surrey Downs #5
sweeper type: broom

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 16	sample no 18
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	13.2			13.6		
37	18.8	2.444444	8.672332	18	2.518519	8.935130
63	38.3	5.925926	21.02383	36.5	5.851852	20.76104
125	64.3	13.01852	46.18674	65.4	12.61111	44.74135
250	88.1	24.92593	88.43150	96.5	24.72222	87.70881
500	78.6	41.24074	146.3127	79.6	42.59259	151.1088
1000	37.3	55.79630	197.9525	29.8	57.33333	203.4056
2000	30.4	62.70370	222.4584	18.1	62.85185	222.9840
6300	11	68.33333	242.4311	.5	66.20370	234.8756
sieve sum	380	70.37037	249.6580	358	66.29630	235.2041
total before sieving	379.7	70.31481	249.4609	358.1	66.31481	235.2698

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .582	c.i. cfm: .591
vac. cfm: 115	vac. cfm: 115
.0000273 curb-km	.0000278 curb-km
.0000170 curb-mi	.0000172 curb-mi

dia., aero.- microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.8			.3		
0.4	.3	.0292733	.1038567	.2	.0108103	.0383532
0.7	.2	.0402507	.1428029	.3	.0180172	.0639219
1.2	.6	.0475690	.1687671	.5	.0288275	.1022751
2	1.4	.0695240	.2466596	1.1	.0468446	.1661971
4	2.2	.1207522	.4284088	2	.0864824	.3068253
10	6.5	.2012537	.7140147	10.6	.1585511	.5625131
stage 1	8.8	.4390989	1.557850	15.5	.5405151	1.917658
precutter	1115.7	.7611047	2.700274	1102.5	1.099047	3.899239
total	1136.5	41.58632	147.5414	1133	40.82691	144.8471

project 80, run no. 10sl date 14 Sep 82
swept lane samples, 10 ft. strips, Bellevue sampler
location:surrey downs #6
sweeper type: ISS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

sample no. 20
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

sample no. 22
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

	INITIAL			RESIDUAL		
dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	9.1			5.2		
37	11.6	1.685185	5.978653	5.6	.9629630	3.416373
63	26	3.833333	13.59979	9.9	2	7.095544
125	45.9	8.648148	30.68166	14.7	3.833333	13.59979
250	77.7	17.14815	60.83772	18.5	6.555556	23.25762
500	82.5	31.53704	111.8862	16.6	9.981481	35.41202
1000	38.5	46.81481	166.0883	7.3	13.05556	46.31813
2000	20.6	53.94444	191.3826	5.6	14.40741	51.11420
6300	14.6	57.75926	204.9167	.4	15.44444	54.79337
sieve sum	326.5	60.46296	214.5088	83.8	15.51852	55.05617
total before sieving	326.2	60.40741	214.3117	83.4	15.44444	54.79337

CASCADE IMPACTOR SAMPLES

c.i. cfm: .587
vac. cfm: 115
.0000276 curb-km
.0000171 curb-mi

c.i. cfm: .589
vac. cfm: 115
.0000277 curb-km
.0000172 curb-mi

	INITIAL			RESIDUAL		
dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.3			.2		
0.4	.2	.0108840	.0386145	.3	.0072313	.0256556
0.7	.3	.0181399	.0643575	.2	.0180783	.0641390
1.2	.4	.0290239	.1029720	.7	.0253097	.0897946
2	1.4	.0435359	.1544581	1.3	.0506194	.1795892
4	1.7	.0943277	.3346591	1.2	.0976231	.3463506
10	3.8	.1560035	.5534747	1.6	.1410111	.5002842
stage 1	11.7	.2938671	1.042592	6.2	.1988618	.7055290
precutter	1213.9	.7183419	2.548558	548.5	.4230334	1.500852
total	1233.7	44.75850	158.7958	560.2	20.25498	71.86133

project 80, run no. 11sl date 15 Sep 82
swept lane samples, 10 ft. strips, Bellevue sampler
location:surrey downs #4
sweeper type: RVS

	INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	24	26
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	16.6			14.7		
37	21	3.074074	10.90611	14.5	2.722222	9.657824
63	44.3	6.962963	24.70301	28.3	5.407407	19.18425
125	67.8	15.16667	53.80788	38.8	10.64815	37.77720
250	85.1	27.72222	98.35212	39	17.83333	63.26860
500	70.9	43.48148	154.2624	23.5	25.05556	88.89140
1000	41	56.61111	200.8433	14.3	29.40741	104.3308
2000	17.2	64.20370	227.7801	7.2	32.05556	113.7258
6300	9	67.38889	239.0804	2.7	33.38889	118.4562
sieve sum	372.9	69.05556	244.9934	183	33.88889	120.2301
total before sieving	371.9	68.87037	244.3364	182.6	33.81481	119.9673

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.59	.599
vac. cfm:	115	115
curb-km	.0000277	.0000281
curb-mi	.0000172	.0000175

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.3			.1		
0.4	.4	.0108286	.0384182	.2	.0035553	.0126136
0.7	.5	.0252668	.0896424	.3	.0106659	.0378409
1.2	.8	.0433145	.1536727	.4	.0213318	.0756819
2	1.4	.0721908	.2561211	.7	.0355531	.1261365
4	1.5	.1227244	.4354059	1	.0604402	.2144320
10	6.3	.1768675	.6274968	5.8	.0959933	.3405684
stage 1	12.9	.4042687	1.434278	9.7	.3022012	1.072160
precutter	1064.7	.8698996	3.086260	548.5	.6470661	2.295683
total	1088.8	39.30069	139.4323	566.7	20.14793	71.48153

project 80, run no. 15sl date 17 Sep 82
swept lane samples, 10 ft. strips, Bellevue sampler
location:surrey downs #6
sweeper type: broom

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL		RESIDUAL	
sample no.	34	sample no.	36
40	strips	40	strips
13.5	cm wide	13.5	cm wide
.0054	curb-km	.0054	curb-km
.0033556	curb-mi	.0033556	curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	4.5			3.5		
37	5.9	.8333333	2.956477	4.5	.6481481	2.299482
63	12.5	1.925926	6.832746	9.4	1.481481	5.255959
125	18	4.240741	15.04518	14.8	3.222222	11.43171
250	21.5	7.574074	26.87109	21.3	5.962963	21.15523
500	20.7	11.55556	40.99648	20	9.907407	35.14922
1000	11.9	15.38889	54.59627	8.9	13.61111	48.28912
2000	12.1	17.59259	62.41451	7.4	15.25926	54.13637
6300	2.3	19.83333	70.36415	1.7	16.62963	58.99813
sieve sum	109.4	20.25926	71.87523	91.5	16.94444	60.11503
total before sieving	108.5	20.09259	71.28394	91.5	16.94444	60.11503

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.59	c.i. cfm:	.602
vac. cfm:	110	vac. cfm:	110
.0000290	curb-km	.0000296	curb-km
.0000180	curb-mi	.0000184	curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.4			0		
0.4	.2	.0138104	.0489971	.2	0	0
0.7	.3	.0207156	.0734956	.1	.0067676	.0240102
1.2	.6	.0310734	.1102434	.2	.0101513	.0360153
2	1.4	.0517891	.1837391	.3	.0169189	.0600255
4	1.1	.1001255	.3552289	.3	.0270703	.0960408
10	1.1	.1381042	.4899709	1.1	.0372216	.1320561
stage 1	5	.1760829	.6247129	3.5	.0744432	.2641122
precutter	268.9	.3487131	1.237176	189	.1928756	.6842907
total	279	9.632768	34.17547	194.7	6.588224	23.37393

project 80, run no. 16sl date 21 Sep 82
swept lane samples, 10 ft. strips, Bellevue sampler
location:surrey downs #4
sweeper type: ISS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL		RESIDUAL	
sample no.	42	sample no.	43
40	strips	40	strips
13.5	cm wide	13.5	cm wide
.0054	curb-km	.0054	curb-km
.0033556	curb-mi	.0033556	curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	12.6			6.5		
37	10.3	2.333333	8.278135	7.9	1.203704	4.270466
63	23.6	4.240741	15.04518	15.3	2.666667	9.460725
125	34	8.611111	30.55026	19.7	5.5	19.51275
250	37.8	14.90741	52.88808	16.3	9.148148	32.45554
500	24.9	21.90741	77.72249	8.9	12.16667	43.16456
1000	13.4	26.51852	94.08166	4.7	13.81481	49.01181
2000	7.2	29	102.8854	3.8	14.68519	52.09969
6300	3.6	30.33333	107.6158	0	15.38889	54.59627
sieve sum	167.4	31	109.9809	83.1	15.38889	54.59627
total before sieving	161.3	29.87037	105.9733	83.2	15.40741	54.66197

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.594	c.i. cfm:	.593
vac. cfm:	110	vac. cfm:	110
.0000292	curb-km	.0000291	curb-km
.0000181	curb-mi	.0000181	curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			0		
0.4	.1	0	0	0	0	0
0.7	.3	.0034294	.0121668	.1	0	0
1.2	.4	.0137174	.0486671	.3	.0034351	.0121873
2	.9	.0274348	.0973343	.8	.0137406	.0487492
4	1.7	.0582990	.2068354	1.4	.0412217	.1462476
10	2.8	.1165981	.4136707	1.9	.0893136	.3168699
stage 1	8.9	.2126200	.7543407	5.2	.1545812	.5484286
precutter	364.8	.5178326	1.837185	144.6	.3332084	1.182168
total	379.9	13.02812	46.22162	154.3	5.300418	18.80501

project 80, run no. 17sl date 21 Sep 82
swept lane samples, 10 ft. strips, Bellevue sampler
location:surrey downs #5
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 40	sample no. 41
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	9.3			11.7		
37	11.3	1.722222	6.110052	10.5	2.166667	7.686839
63	26.4	3.814815	13.53409	20	4.111111	14.58529
125	51.5	8.703704	30.87876	28.5	7.814815	27.72518
250	76.7	18.24074	64.71399	28.1	13.09259	46.44953
500	65.5	32.44444	115.1055	18.8	18.29630	64.91109
1000	27.3	44.57407	158.1387	6.2	21.77778	77.26259
2000	20.2	49.62963	176.0746	5.1	22.92593	81.33596
6300	7.9	53.37037	189.3459	4.2	23.87037	84.68663
sieve sum	292.9	54.83333	194.5362	133.1	24.64815	87.44601
total before sieving	292.9	54.24074	192.4338	132.6	24.55556	87.11751

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .591	c.i. cfm: .588
vac. cfm: 110	vac. cfm: 110
.0000290 curb-km	.0000289 curb-km
.0000180 curb-mi	.0000179 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.4	.1	.0034468	.0122285	.1	0	0
0.7	.2	.0068935	.0244571	.2	.0034643	.0122909
1.2	.2	.0137871	.0489142	.2	.0103930	.0368728
2	.5	.0206806	.0733713	.7	.0173217	.0614547
4	.9	.0379144	.1345140	1.3	.0415722	.1474912
10	3.7	.0689353	.2445709	2.6	.0866087	.3072734
stage 1	7.7	.1964655	.6970271	6.2	.1766818	.6268377
precutter	612.5	.4618663	1.638625	264.4	.3914714	1.388876
total	625.9	21.57329	76.53847	275.7	9.551209	33.88611

project 80, run no. 18sl date 22 Sep 82
swept lane samples, 10 ft. strips, Bellevue sampler
location:surrey downs #2
sweeper type: broom

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	48	49
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	7.6			20.5		
37	25.2	1.407407	4.993161	28.8	3.796296	13.46839
63	63	6.074074	21.54943	66	9.129630	32.38984
125	89.3	17.74074	62.94010	91.7	21.35185	75.75150
250	96.3	34.27778	121.6097	97.4	38.33333	135.9979
500	62.6	52.11111	184.8783	58.1	56.37037	199.9892
1000	25.6	63.70370	226.0062	21.2	67.12963	238.1606
2000	18.8	68.44444	242.8253	10.7	71.05556	252.0889
6300	17.3	71.92593	255.1768	5.3	73.03704	259.1188
sieve sum	405.7	75.12963	266.5428	399.7	74.01852	262.6008
total before sieving	405.3	75.05556	266.2800	398.9	73.87037	262.0752

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.588	.588
vac. cfm:	110	110
curb-km	.0000289	.0000289
curb-mi	.0000179	.0000179

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.6			0		
0.4	.7	.0207861	.0737456	.1	0	0
0.7	.2	.0450365	.1597822	.3	.0034643	.0122909
1.2	.6	.0519652	.1843640	.6	.0138574	.0491637
2	1.6	.0727513	.2581097	1.2	.0346435	.1229094
4	2.2	.1281809	.4547646	2.5	.0762157	.2704006
10	3.7	.2043966	.7251652	6.5	.1628244	.5776740
stage 1	16.2	.3325775	1.179930	12.1	.3880071	1.376585
precutter	719.3	.8938020	3.171062	1079.5	.8071932	2.863788
total	745.1	25.81286	91.57977	1102.8	38.20484	135.5444

project 80, run no. 19sl date 23 Sep 82
swept lane samples,
location:surrey downs #3 10 ft. strips, Bellevue sampler
sweeper type: ISS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	51	53
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	15.1			8.6		
37	16.5	2.796296	9.920622	8.9	1.592593	5.650155
63	32.2	5.851852	20.76104	16.4	3.240741	11.49741
125	41.9	11.81481	41.91627	18.7	6.277778	22.27212
250	45.6	19.57407	69.44435	24.1	9.740741	34.55793
500	30.7	28.01852	99.40332	16.3	14.20370	50.39150
1000	15.4	33.70370	119.5731	5.7	17.22222	61.10052
2000	9.6	36.55556	129.6908	3	18.27778	64.84539
6300	5	38.33333	135.9979	1.5	18.83333	66.81637
sieve sum	212	39.25926	139.2829	103.2	19.11111	67.80187
total before sieving	211.9	39.24074	139.2172	103	19.07407	67.67047

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.554	.551
vac. cfm:	110	110
curb-km	.0000272	.0000270
curb-mi	.0000169	.0000168

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.1			.4		
0.4	.2	.0036770	.0130453	.1	.0147879	.0524651
0.7	.2	.0110309	.0391358	.2	.0184849	.0655814
1.2	.6	.0183848	.0652263	.2	.0258789	.0918140
2	1.5	.0404466	.1434978	.6	.0332728	.1180465
4	2.5	.0956010	.3391766	.8	.0554547	.1967442
10	2.3	.1875251	.6653079	2.1	.0850306	.3016744
stage 1	7.7	.2720952	.9653488	6.1	.1626672	.5771163
precutter	542.4	.5552213	1.969833	262.5	.3881831	1.377209
total	557.5	20.49906	72.72729	273	10.09276	35.80745

project 80, run no. 20sl date 23 Sep 82
swept lane samples, 10 ft. strips, Bellevue sampler
location:surrey downs #1
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 54	sample no. 56
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

dia., microns	INITIAL sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	RESIDUAL sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	18.1			9.9		
37	22.9	3.351852	11.89161	17	1.833333	6.504249
63	55	7.592593	26.93679	32.4	4.981481	17.67316
125	100.5	17.77778	63.07150	49.5	10.98148	38.95979
250	140.2	36.38889	129.0995	50.6	20.14815	71.48104
500	103.3	62.35185	221.2102	35	29.51852	104.7250
1000	41	81.48148	289.0777	12.8	36	127.7198
2000	31.1	89.07407	316.0145	8.7	38.37037	136.1293
6300	9.1	94.83333	336.4470	2.6	39.98148	141.8452
sieve sum	521.2	96.51852	342.4257	218.5	40.46296	143.5534
total before sieving	520.7	96.42593	342.0972	218	40.37037	143.2249

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .559	c.i. cfm: .573
vac. cfm: 110	vac. cfm: 110
.0000274 curb-km	.0000281 curb-km
.0000171 curb-mi	.0000175 curb-mi

dia., aero.-microns	INITIAL stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	RESIDUAL stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.3		
0.4	.1	0	0	.1	.0106651	.0378381
0.7	.1	.0036441	.0129286	0	.0142202	.0504508
1.2	.5	.0072881	.0258571	.2	.0142202	.0504508
2	1.2	.0255085	.0905000	1.1	.0213302	.0756761
4	2.7	.0692374	.2456428	1.5	.0604357	.2144157
10	5.4	.1676274	.5947142	3.2	.1137612	.4036060
stage 1	8.5	.3644073	1.292857	6	.2275225	.8072121
precutter	1540.1	.6741536	2.391785	421.6	.4408248	1.563973
total	1558.6	56.79653	201.5047	434	15.42887	54.73907

project 80, run no. 21sl date 27 Sep 82
swept lane samples, 8 ft. strips, Bellevue sampler
location:S.E. 30th no. 3
sweeper type: broom

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

sample no. 59
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

sample no. 61
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	7.4			17.7		
37	16.4	2.740741	9.723523	30.1	6.555556	23.25762
63	61.2	8.814815	31.27295	77.1	17.70370	62.80870
125	119.7	31.48148	111.6891	125.7	46.25926	164.1173
250	129.1	75.81481	268.9737	117.6	92.81481	329.2858
500	80.1	123.6296	438.6097	50.8	136.3704	483.8110
1000	31.5	153.2963	543.8603	13.1	155.1852	550.5617
2000	20	164.9630	585.2510	9.8	160.0370	567.7749
6300	14.5	172.3704	611.5308	3.7	163.6667	580.6520
sieve sum	479.9	177.7407	630.5836	445.6	165.0370	585.5138
total before sieving	479.2	177.4815	629.6638	445.4	164.9630	585.2510

CASCADE IMPACTOR SAMPLES

c.i. cfm: .578
vac. cfm: 105
.0000149 curb-km
.0000092 curb-mi

c.i. cfm: .579
vac. cfm: 105
.0000149 curb-km
.0000093 curb-mi

dia., aero.- microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.1		
0.4	.1	0	0	.2	.0067166	.0238292
0.7	.1	.0067282	.0238705	.5	.0201497	.0714877
1.2	.6	.0134564	.0477410	.9	.0537325	.1906340
2	1.4	.0538255	.1909638	2.3	.1141815	.4050972
4	1.8	.1480200	.5251505	3.9	.2686624	.9531699
10	2.7	.2691273	.9548190	4.1	.5306083	1.882511
stage 1	5.2	.4507882	1.599322	7.8	.8059873	2.859510
precutter	468.9	.8006536	2.840587	1018.7	1.329879	4.718191
total	480.8	32.34910	114.7692	1038.5	69.75149	247.4667

project 80, run no. 22sl date 27 Sep 82
swept lane samples, 8 ft. strips, Bellevue sampler
location:S.E. 30th St. #2
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	63	65
strips	20	20
cm wide	13.5	13.5
curb-km	.0027	.0027
curb-mi	.0016778	.0016778

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	13.7			10		
37	35.4	5.074074	18.00166	16.6	3.703704	13.13990
63	104.4	18.18519	64.51689	50.6	9.851852	34.95212
125	227.3	56.85185	201.6974	61.2	28.59259	101.4400
250	268.7	141.0370	500.3673	43.5	51.25926	181.8562
500	141.2	240.5556	853.4363	20.6	67.37037	239.0147
1000	39.6	292.8519	1038.972	7.9	75	266.0829
2000	25.9	307.5185	1091.006	6.6	77.92593	276.4634
6300	5	317.1111	1125.038	1	80.37037	285.1358
sieve sum	861.2	318.9630	1131.608	218	80.74074	286.4497
total before sieving	860.6	318.7407	1130.819	217.3	80.48148	285.5299

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.582	.588
vac. cfm:	105	105
curb-km	.0000150	.0000151
curb-mi	.0000093	.0000094

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.6			.2		
0.4	.4	.0400916	.1422385	.3	.0132275	.0469290
0.7	.3	.0668194	.2370642	.2	.0330688	.1173226
1.2	.8	.0868652	.3081834	.6	.0462963	.1642516
2	2.4	.1403207	.4978348	.6	.0859788	.3050387
4	1.9	.3006873	1.066789	.8	.1256614	.4458258
10	1.8	.4276441	1.517211	1.4	.1785714	.6335419
stage 1	9.8	.5479191	1.943926	4.4	.2711640	.9620451
precutter	2430.1	1.202749	4.267155	812	.5621693	1.994484
total	2448.1	163.5806	580.3568	820.5	54.26587	192.5263

project 80, run no. 23sl date 29 Sep 82
swept lane samples,
location:S. E. 30th St. #1 8 ft. strips, Bellevue sampler
sweeper type: ISS

	INITIAL			RESIDUAL		

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 67	sample no. 69
20 strips	20 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0027 curb-km
.0016778 curb-mi	.0016778 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	4.1			2.6		
37	9.6	1.518519	5.387358	4.8	.9629630	3.416373
63	35.1	5.074074	18.00166	13.9	2.740741	9.723523
125	62.2	18.07407	64.12269	25.2	7.888889	27.98798
250	66.7	41.11111	145.8529	21.1	17.22222	61.10052
500	49.4	65.81481	233.4960	13	25.03704	88.82570
1000	23.8	84.11111	298.4070	6	29.85185	105.9076
2000	17.2	92.92593	329.6800	5.3	32.07407	113.7915
6300	9.6	99.29630	352.2806	1.4	34.03704	120.7556
sieve sum	277.7	102.8519	364.8949	93.3	34.55556	122.5952
total before sieving	277.2	102.6667	364.2379	92.9	34.40741	122.0696

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .557	c.i. cfm: .563
vac. cfm: 105	vac. cfm: 105
.0000143 curb-km	.0000145 curb-km
.0000089 curb-mi	.0000090 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.1		
0.4	.2	0	0	.2	.0069074	.0245065
0.7	0	.0139637	.0495409	.2	.0207223	.0735194
1.2	.3	.0139637	.0495409	.2	.0345372	.1225323
2	.6	.0349092	.1238522	.2	.0483521	.1715452
4	.4	.0768003	.2724748	.2	.0621670	.2205581
10	.8	.1047277	.3715566	.5	.0759818	.2695710
stage 1	2.4	.1605825	.5697201	3.6	.1105190	.3921033
precutter	584.8	.3281468	1.164211	247.8	.3591869	1.274336
total	589.5	41.15799	146.0217	253	17.47582	62.00133

project 80, run no. 24sl date 30 Sep 82
swept lane samples, 8 ft. strips, Bellevue sampler
location:S. E. 30th St. #2
sweeper type: broom

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	71	73
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	29.5			8.7		
37	59	5.462963	19.38135	23.3	1.611111	5.715855
63	102.3	16.38889	58.14404	69.7	5.925926	21.02383
125	158.8	35.33333	125.3546	120.6	18.83333	66.81637
250	153.5	64.74074	229.6854	127.2	41.16667	146.0499
500	72.8	93.16667	330.5341	81.8	64.72222	229.6197
1000	25.1	106.6481	378.3633	27.5	79.87037	283.3619
2000	18	111.2963	394.8539	19.3	84.96296	301.4292
6300	7.4	114.6296	406.6798	9.1	88.53704	314.1092
sieve sum	626.4	116	411.5416	487.2	90.22222	320.0879
total before sieving	626.2	115.9630	411.4102	486.9	90.16667	319.8908

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.538	.538
vac. cfm:	105	105
curb-km	.0000277	.0000277
curb-mi	.0000172	.0000172

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.3			0		
0.4	.1	.0108426	.0384678	0	0	0
0.7	.3	.0144568	.0512905	.2	0	0
1.2	.7	.0252995	.0897583	.7	.0072284	.0256452
2	1.6	.0505989	.1795166	1	.0325279	.1154035
4	1.2	.1084263	.3846785	1.5	.0686700	.2436297
10	1.9	.1517968	.5385499	1.1	.1228831	.4359689
stage 1	6.3	.2204667	.7821796	5.2	.1626394	.5770177
precutter	1862.6	.4481619	1.590004	1280.1	.3505783	1.243794
total	1875	67.76642	240.4240	1289.8	46.61607	165.3861

```
project 80,  run no.       25sl     date 30 Sep 82
swept lane samples,                8 ft. strips, Bellevue sampler
location:S. E. 30th St. #3
sweeper type:     ISS

                  INITIAL                         RESIDUAL

                           VACUUM CLEANER SAMPLES
                 sample no.        75             sample no.         77
                         40 strips                         40 strips
                       13.5 cm wide                      13.5 cm wide
                      .0054 curb-km                     .0054 curb-km
                   .0033556 curb-mi                  .0033556 curb-mi

                  ----cumulative----                ----cumulative----
         sieve    ---smaller than---       sieve    ---smaller than---
dia.,       wt.,  kg/      lb/               wt.,   kg/      lb/
microns      g      curb-km  curb-mi          g       curb-km  curb-mi

pan           12.4                                7.3
37            34.8 2.296296 8.146736             11.2 1.351852 4.796062
63           124.8 8.740741 31.01016             32.2 3.425926 12.15440
125          249.5 31.85185 113.0031             45.2 9.388889 33.30964
250          221.5 78.05556 276.9233             43.8 17.75926 63.00580
500          110.3 119.0741 422.4477             23.2 25.87037 91.78218
1000          35.5    139.5 494.9142             11.8 30.16667 107.0245
2000            26 146.0741 518.2375             14.8 32.35185 114.7770
6300           4.6 150.8889 535.3194                0 35.09259 124.5005
sieve sum    819.4 151.7407 538.3416            189.5 35.09259 124.5005
total        819.3 151.7222 538.2759              189       35 124.1720
 before
 sieving
                          CASCADE IMPACTOR SAMPLES
                  c.i. cfm:     .562              c.i. cfm:     .567
                  vac. cfm:      105              vac. cfm:      105
                   .0000289 curb-km                  .0000292 curb-km
                   .0000180 curb-mi                  .0000181 curb-mi

                  ----cumulative----                ----cumulative----
dia.,      stage  ---smaller than---       stage    ---smaller than---
aero.-      wt.,  kg/      lb/               wt.,   kg/      lb/
microns      mg     curb-km  curb-mi          mg      curb-km  curb-mi

filter          .1                                  0
0.4             .5 .0034599 .0122750               .2        0        0
0.7             .8 .0207592 .0736502               .6 .0068587 .0243336
1.2             .9 .0484381 .1718504               .8 .0274348 .0973343
2              1.6 .0795769 .2823257              1.6 .0548697 .1946686
4              2.8 .1349348 .4787262              1.9 .1097394 .3893371
10             3.8 .2318110 .8224271              1.8 .1748971 .6205061
stage 1        6.4 .3632859 1.288878              5.5 .2366255 .8395082
precutter   1443.1 .5847173 2.074480            415.1 .4252401 1.508681
total         1460 50.51404 179.2154            427.5 14.66049 52.01301
```

project 80, run no. 26sl date 1 Oct 82
swept lane samples, 8 ft. strips, Bellevue sampler
location:S. E. 30th St. #1
sweeper type: RVS

	INITIAL	RESIDUAL
VACUUM CLEANER SAMPLES		
sample no.	79	81
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

dia., microns	sieve wt., g	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi	sieve wt., g	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi
pan	16.8			6.1		
37	28.9	3.111111	11.03751	10.3	1.129630	4.007668
63	100.3	8.462963	30.02466	23.9	3.037037	10.77472
125	168.7	27.03704	95.92124	29.9	7.462963	26.47689
250	74.6	58.27778	206.7563	21.4	13	46.12104
500	34.9	72.09259	255.7681	10.4	16.96296	60.18073
1000	17	78.55556	278.6972	5.6	18.88889	67.01347
2000	18.4	81.70370	289.8661	7.2	19.92593	70.69264
6300	9.2	85.11111	301.9548	8.9	21.25926	75.42301
sieve sum	468.8	86.81481	307.9992	123.7	22.90741	81.27026
total before sieving	467.7	86.61111	307.2765	123	22.77778	80.81036

	INITIAL	RESIDUAL
CASCADE IMPACTOR SAMPLES		
c.i. cfm:	.53	.53
vac. cfm:	105	105
curb-km	.0000273	.0000273
curb-mi	.0000169	.0000169

dia., aero.- microns	stage wt., mg	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi	stage wt., mg	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi
filter	.3			.3		
0.4	.2	.0110063	.0390485	.2	.0110063	.0390485
0.7	.3	.0183438	.0650808	.4	.0183438	.0650808
1.2	.5	.0293501	.1041293	.3	.0330189	.1171455
2	1.4	.0476939	.1692101	.5	.0440252	.1561940
4	2.6	.0990566	.3514364	1.2	.0623690	.2212748
10	1.4	.1944444	.6898567	1.5	.1063941	.3774688
stage 1	4.6	.2458071	.8720830	3.4	.1614256	.5727112
precutter	250.4	.4145702	1.470827	135.1	.2861635	1.015261
total	261.7	9.601153	34.06330	142.9	5.242662	18.60010

project 80, run no. 27sl date 4 Oct 82
swept lane samples, 8 ft. strips, Bellevue sampler
location:S. E. 30th St. #2
sweeper type: ISS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 83	sample no. 85
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	7.5			12.3		
37	27.2	1.388889	4.927461	17.2	2.277778	8.081036
63	101.7	6.425926	22.79772	39.3	5.462963	19.38135
125	156.3	25.25926	89.61409	44.2	12.74074	45.20124
250	141.3	54.20370	192.3024	35.3	20.92593	74.24041
500	68	80.37037	285.1358	22.7	27.46296	97.43233
1000	20.1	92.96296	329.8114	9.8	31.66667	112.3461
2000	16.1	96.68519	343.0170	11.1	33.48148	118.7847
6300	3.3	99.66667	353.5946	1.4	35.53704	126.0773
sieve sum	541.5	100.2778	355.7627	193.3	35.79630	126.9971
total before sieving	540.6	100.1111	355.1714	192.9	35.72222	126.7343

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .556	c.i. cfm: .556
vac. cfm: 105	vac. cfm: 105
.0000286 curb-km	.0000286 curb-km
.0000178 curb-mi	.0000178 curb-mi

dia., aero.- microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.2			.4		
0.4	.1	.0069944	.0248150	.2	.0139888	.0496300
0.7	.1	.0104916	.0372225	.4	.0209832	.0744450
1.2	.5	.0139888	.0496300	1	.0349720	.1240750
2	1	.0314748	.1116675	1.9	.0699440	.2481499
4	1.8	.0664468	.2357424	1.6	.1363909	.4838923
10	1.7	.1293965	.4590773	1.4	.1923461	.6824122
stage 1	3.2	.1888489	.6700047	3.8	.2413070	.8561172
precutter	1323.3	.3007594	1.067045	501.4	.3742006	1.327602
total	1331.9	46.57924	165.2554	512.1	17.90917	63.53878

project 80, run no. 28sl date 4 Oct 82
swept lane samples, 8 ft. strips, Bellevue sampler
location:S. E. 30th St. #3
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	86	88
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	4.2			7.1		
37	9.1	.7777778	2.759378	14.9	1.314815	4.664663
63	32.2	2.462963	8.738031	43.1	4.074074	14.45389
125	61.6	8.425926	29.89326	59.4	12.05556	42.77036
250	66.8	19.83333	70.36415	43.6	23.05556	81.79586
500	40.6	32.20370	114.2514	17.7	31.12963	110.4408
1000	14.7	39.72222	140.9254	5.8	34.40741	122.0696
2000	14.2	42.44444	150.5832	4.1	35.48148	125.8802
6300	3.6	45.07407	159.9125	2.1	36.24074	128.5739
sieve sum	247	45.74074	162.2777	197.8	36.62963	129.9536
total before sieving	245.9	45.53704	161.5550	197.6	36.59259	129.8222

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.514	.479
vac. cfm:	105	105
curb-km	.0000264	.0000246
curb-mi	.0000164	.0000153

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.4	.1	.0037830	.0134213	.1	0	0
0.7	.2	.0075659	.0268427	.2	.0040594	.0144020
1.2	.1	.0151319	.0536853	.4	.0121781	.0432061
2	.4	.0189148	.0671067	.5	.0284157	.1008141
4	.4	.0340467	.1207920	.4	.0487126	.1728242
10	.3	.0491786	.1744774	.2	.0649501	.2304323
stage 1	1.4	.0605275	.2147414	.6	.0730689	.2592363
precutter	1578.7	.1134890	.4026401	356.6	.0974252	.3456485
total	1581.7	59.83517	212.2853	359	14.57318	51.70325

project 80, run no. 29sl date 5 Oct 82
swept lane samples, 8 ft. strips, Bellevue sampler
location:S. E. 30th St. #1
sweeper type: broom

INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. 90	sample no. 92
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	12.3			9.2		
37	16.5	2.277778	8.081036	13.2	1.703704	6.044352
63	61.9	5.333333	18.92145	40	4.148148	14.71668
125	140.5	16.79630	59.58943	65.5	11.55556	40.99648
250	124.2	42.81481	151.8972	62.4	23.68519	84.02964
500	57.3	65.81481	233.4960	37.2	35.24074	125.0261
1000	21	76.42593	271.1418	14.7	42.12963	149.4663
2000	17.4	80.31481	284.9387	11.1	44.85185	159.1241
6300	6.3	83.53704	296.3704	2.9	46.90741	166.4168
sieve sum	457.4	84.70370	300.5094	256.2	47.44444	168.3221
total before sieving	456	84.44444	299.5896	255.8	47.37037	168.0593

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .502	c.i. cfm: .458
vac. cfm: 105	vac. cfm: 105
.0000258 curb-km	.0000236 curb-km
.0000160 curb-mi	.0000146 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.2			.1		
0.4	.1	.0077468	.0274843	.1	.0042455	.0150624
0.7	.4	.0116202	.0412265	.2	.0084910	.0301247
1.2	.7	.0271138	.0961952	.1	.0169820	.0602495
2	1.3	.0542275	.1923903	.2	.0212276	.0753119
4	2.4	.1045817	.3710385	.5	.0297186	.1054366
10	1.9	.1975432	.7008505	1.2	.0509461	.1807485
stage 1	3.5	.2711377	.9619516	2.3	.1018923	.3614970
precutter	1155.6	.4067065	1.442927	406.7	.1995391	.7079316
total	1166.1	45.16766	160.2474	411.4	17.46604	61.96661

APPENDIX D -- SAN DIEGO HALF-OF-STREET DATA

Test No: 80-06-01
Date: 01-11-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: morena-n
Sweeper Type: bsb

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
	40 strips	40 strips
	13.5 cm wide	13.5 cm wide
	.0054 curb-km	.0054 curb-km
	.0033556 curb-mi	.0033556 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	48.7			6.2		
38	82.4	9.018519	31.99565	50.4	1.148148	4.073368
63	109.8	24.27778	86.13202	141.1	10.48148	37.18591
125	201.9	44.61111	158.2701	126.7	36.61111	129.8879
500	184.9	82	290.9173	79.3	60.07407	213.1291
2000	61.1	116.2407	412.3956	21.4	74.75926	265.2288
5600	29.4	127.5556	452.5380	14	78.72222	279.2885
sieve sum	718.2	133.0000	471.8537	439.1	81.31481	288.4864
total before sieving	719.3	133.2037	472.5764	439.2	81.33333	288.5521

CASCADE IMPACTOR SAMPLES

	INITIAL		RESIDUAL	
c.i. cfm:	.475		.475	
vac. cfm:	72		72	
	.0000356	curb-km	.0000356	curb-km
	.0000221	curb-mi	.0000221	curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.1			.2		
0.5	.3	.0028070	.0099588	.5	.0056140	.0199177
0.8	2.1	.0112281	.0398353	1.8	.0196491	.0697118
1.4	5.4	.0701754	.2489708	5.5	.0701754	.2489708
2	12.8	.2217544	.7867479	13.7	.2245614	.7967067
4	47.4	.5810526	2.061479	32	.6091228	2.161067
11	236	1.911579	6.781966	100.2	1.507368	5.347894
stage 1	37.8	8.536140	30.28481	45.7	4.32	15.32665
precutter	2330	9.597193	34.04925	1695.4	5.602807	19.87783
total	2671.9	75.00070	266.0901	1895	53.19298	188.7199

Test No: 80-06-02
Date: 01-12-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: morena-s
Sweeper Type: as

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
strips	40	40
cm wide	13.5	13.5
curb-km	.0054	.0054
curb-mi	.0033556	.0033556

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	25			10.4		
38	33.8	4.629630	16.42487	8	1.925926	6.832746
63	49.1	10.88889	38.63130	12.8	3.407407	12.08870
125	128.1	19.98148	70.88974	29.7	5.777778	20.49824
500	89.4	43.70370	155.0508	15.3	11.27778	40.01098
2000	26.7	60.25926	213.7861	3.1	14.11111	50.06301
5600	9.5	65.20370	231.3279	.4	14.68519	52.09969
sieve sum	361.6	66.96296	237.5693	79.7	14.75926	52.36249
total before sieving	362.1	67.05556	237.8978	80.2	14.85185	52.69098

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.475	.475
vac. cfm:	72	72
curb-km	.0000356	.0000356
curb-mi	.0000221	.0000221

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.3			.1		
0.5	.2	.0084211	.0298765	.1	.0028070	.0099588
0.8	.8	.0140351	.0497942	.5	.0056140	.0199177
1.4	2.8	.0364912	.1294648	1.7	.0196491	.0697118
2	11.5	.1150877	.4083122	3.6	.0673684	.2390120
4	13.1	.4378947	1.553578	6	.1684211	.5975300
11	59.9	.8056140	2.858185	13.3	.3368421	1.195060
stage 1	48.4	2.487018	8.823527	23.4	.7101754	2.519585
precutter	1209.2	3.845614	13.64360	291	1.367018	4.849952
total	1346.2	37.78807	134.0658	339.7	9.535439	33.83016

Test No: 80-06-03
Date: 01-13-83
Sample type: [   ] 8 ft. Sweeping Lane
[x   ] Half of Street
Location: mission-w
Sweeper Type: bsb

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
60 strips	60 strips
13.5 cm wide	13.5 cm wide
.0081 curb-km	.0081 curb-km
.0050333 curb-mi	.0050333 curb-mi

	INITIAL			RESIDUAL		
dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	10.8			13.5		
38	54.2	1.333333	4.730363	46.7	1.666667	5.912953
63	151	8.024691	28.46978	122.6	7.432099	26.36739
125	299.3	26.66667	94.60725	212.5	22.56790	80.06577
500	57.4	63.61728	225.6996	25.6	48.80247	173.1400
2000	10	70.70370	250.8406	2.6	51.96296	184.3527
5600	2.5	71.93827	255.2206	.2	52.28395	185.4915
sieve sum	585.2	72.24691	256.3156	423.7	52.30864	185.5791
total before sieving	585.8	72.32099	256.5784	424.2	52.37037	185.7981

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.475	c.i. cfm:	.475
vac. cfm:	72	vac. cfm:	72
.0000534	curb-km	.0000534	curb-km
.0000332	curb-mi	.0000332	curb-mi

	INITIAL			RESIDUAL		
dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.4			.4		
0.5	3.4	.0074854	.0265569	.4	.0074854	.0265569
0.8	4.6	.0711111	.2522905	1.5	.0149708	.0531138
1.4	6.4	.1571930	.5576947	4.3	.0430409	.1527021
2	16.4	.2769591	.9826050	9.5	.1235088	.4381887
4	40.2	.5838596	2.071437	21.5	.3012865	1.068915
11	112.4	1.336140	4.740405	81.9	.7036257	2.496348
stage 1	112.5	3.439532	12.20289	37.8	2.236257	7.933871
precutter	2248.3	5.544795	19.67202	1340.2	2.943626	10.44350
total	2544.6	47.61825	168.9417	1497.5	28.02339	99.42236

Test No: 80-06-04
Date: 01-14-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-e
Sweeper Type: bsa

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
40 strips	60 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0081 curb-km
.0033556 curb-mi	.0050333 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	11.5			5.2		
38	20	2.129630	7.555440	20.1	.6419753	2.277582
63	80.3	5.833333	20.69534	70.7	3.123457	11.08131
125	418.3	20.70370	73.45202	258.4	11.85185	42.04767
500	68.9	98.16667	348.2730	33.6	43.75309	155.2260
2000	13.9	110.9259	393.5399	4.9	47.90123	169.9427
5600	6.9	113.5	402.6721	2.1	48.50617	172.0888
sieve sum	619.8	114.7778	407.2054	395	48.76543	173.0086
total before sieving	620.4	114.8889	407.5996	397.8	49.11111	174.2350

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000356 curb-km	.0000534 curb-km
.0000221 curb-mi	.0000332 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.4			.5		
0.5	.5	.0112281	.0398353	.3	.0093567	.0331961
0.8	.8	.0252632	.0896295	.8	.0149708	.0531138
1.4	2.3	.0477193	.1693002	2	.0299415	.1062276
2	5.8	.1122807	.3983534	5.4	.0673684	.2390120
4	11.3	.2750877	.9759657	11.5	.1684211	.5975300
11	38	.5922807	2.101314	30.2	.3836257	1.361041
stage 1	39.7	1.658947	5.885671	40.2	.9487719	3.366086
precutter	1653.2	2.773333	9.839328	1086.9	1.701053	6.035053
total	1752	49.17895	174.4788	1177.8	22.04070	78.19676

Test No: 80-06-05
Date: 01-18-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-e
Sweeper Type: iss

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	60 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0081 curb-km
.0016778 curb-mi	.0050333 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	2.6			8.9		
38	7	.9629630	3.416373	14.4	1.098765	3.898169
63	30.2	3.555556	12.61430	38.2	2.876543	10.20532
125	175.7	14.74074	52.29679	130.3	7.592593	26.93679
500	22.4	79.81481	283.1648	16.7	23.67901	84.00774
2000	5.9	88.11111	312.5981	3.6	25.74074	91.32228
5600	6.4	90.29630	320.3507	1.6	26.18519	92.89907
sieve sum	250.2	92.66667	328.7602	213.7	26.38272	93.59986
total before sieving	250.9	92.92593	329.6800	214.7	26.50617	94.03786

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.475	c.i. cfm:	.475
vac. cfm:	72	vac. cfm:	72
.0000178	curb-km	.0000534	curb-km
.0000111	curb-mi	.0000332	curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			0		
0.5	.1	0	0	0	0	0
0.8	.1	.0056140	.0199177	.7	0	0
1.4	.4	.0112281	.0398353	1.2	.0130994	.0464746
2	1.8	.0336842	.1195060	3.9	.0355556	.1261452
4	2	.1347368	.4780240	8.1	.1085380	.3850749
11	10.5	.2470175	.8763774	17	.2601170	.9228519
stage 1	8.8	.8364912	2.967733	25.9	.5782456	2.051520
precutter	657.9	1.330526	4.720487	568.7	1.062924	3.771078
total	681.6	38.26526	135.7588	625.5	11.70526	41.52834

Test No: 80-06-06
Date: 01-20-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-w
Sweeper Type: as

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	40 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0054 curb-km
.0016778 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	3.1			4		
38	18.8	1.148148	4.073368	18.9	.7407407	2.627979
63	90.6	8.111111	28.77637	88	4.240741	15.04518
125	210.7	41.66667	147.8238	175.3	20.53704	72.86073
500	16.9	119.7037	424.6815	11	53	188.0319
2000	2.7	125.9630	446.8879	1.6	55.03704	195.2589
5600	1.3	126.9630	450.4356	.4	55.33333	196.3101
sieve sum	344.1	127.4444	452.1438	299.2	55.40741	196.5729
total before sieving	344.9	127.7407	453.1950	299.7	55.5	196.9013

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.475	c.i. cfm:	.475
vac. cfm:	72	vac. cfm:	72
.0000178	curb-km	.0000356	curb-km
.0000111	curb-mi	.0000221	curb-mi

dia., aero.- microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.2			0		
0.5	0	.0112281	.0398353	.2	0	0
0.8	.4	.0112281	.0398353	.6	.0056140	.0199177
1.4	1.1	.0336842	.1195060	1.5	.0224561	.0796707
2	2.9	.0954386	.3386004	3.7	.0645614	.2290532
4	8.5	.2582456	.9162127	8.6	.1684211	.5975300
11	24.6	.7354386	2.609214	30.6	.4098246	1.453990
stage 1	21.8	2.116491	7.508961	30.1	1.268772	4.501393
precutter	1112.2	3.340351	11.85101	902	2.113684	7.499002
total	1171.7	65.77965	233.3753	977.3	27.43298	97.32768

Test No: 80-06-07
Date: 01-21-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-e
Sweeper Type: bsa

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	40 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0054 curb-km
.0016778 curb-mi	.0033556 curb-mi

	INITIAL	----cumulative---- ---smaller than---		RESIDUAL	----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	2.7			1.8		
38	10.5	1	3.547772	9.4	.3333333	1.182591
63	92.2	4.888889	17.34466	54.7	2.074074	7.358342
125	817.5	39.03704	138.4945	319.5	12.20370	43.29596
500	62.3	341.8148	1212.681	24	71.37037	253.2058
2000	12	364.8889	1294.543	3.6	75.81481	268.9737
5600	28.1	369.3333	1310.310	3.3	76.48148	271.3389
sieve sum	1025.3	379.7407	1347.234	416.3	77.09259	273.5069
total before sieving	1025.2	379.7037	1347.102	417.1	77.24074	274.0325

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.475	c.i. cfm:	.475
vac. cfm:	72	vac. cfm:	72
.0000178 curb-km		.0000356 curb-km	
.0000111 curb-mi		.0000221 curb-mi	

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	0			0		
0.5	.2	0	0	.1	0	0
0.8	.4	.0112281	.0398353	.3	.0028070	.0099588
1.4	1.1	.0336842	.1195060	.8	.0112281	.0398353
2	4.4	.0954386	.3386004	2.3	.0336842	.1195060
4	14.7	.3424561	1.214978	4.3	.0982456	.3485592
11	28.2	1.167719	4.142875	19.8	.2189474	.7767890
stage 1	15.4	2.750877	9.759657	16.8	.7747368	2.748638
precutter	2435.9	3.615439	12.82698	1219.7	1.246316	4.421722
total	2500.3	140.3677	498.0015	1264.1	35.48351	125.8896

Test No: 80-06-08
Date: 01-24-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-w
Sweeper Type: bsb

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	40 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0054 curb-km
.0016778 curb-mi	.0033556 curb-mi

dia., microns	INITIAL sieve wt., g	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi	RESIDUAL sieve wt., g	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi
pan	4.3			2.7		
38	11.5	1.592593	5.650155	15.2	.5	1.773886
63	44.3	5.851852	20.76104	65.6	3.314815	11.76021
125	149.3	22.25926	78.97078	119	15.46296	54.85907
500	20	77.55556	275.1494	10.8	37.50000	133.0415
2000	.9	84.96296	301.4292	.7	39.50000	140.1370
5600	.6	85.29630	302.6118	.8	39.62963	140.5969
sieve sum	230.9	85.51852	303.4002	214.8	39.77778	141.1225
total before sieving	231.1	85.59259	303.6630	214.5	39.72222	140.9254

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.475	c.i. cfm:	.475
vac. cfm:	72	vac. cfm:	72
.0000178 curb-km		.0000356 curb-km	
.0000111 curb-mi		.0000221 curb-mi	

dia., aero.-microns	INITIAL stage wt., mg	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi	RESIDUAL stage wt., mg	cumulative smaller than kg/ curb-km	cumulative smaller than lb/ curb-mi
filter	0			0		
0.5	.1	0	0	0	0	0
0.8	.5	.0056140	.0199177	.5	0	0
1.4	.5	.0336842	.1195060	1.2	.0140351	.0497942
2	1.7	.0617544	.2190943	3.1	.0477193	.1693002
4	2.5	.1571930	.5576947	7.1	.1347368	.4780240
11	17.6	.2975439	1.055636	28.4	.3340351	1.185101
stage 1	14.1	1.285614	4.561146	29.1	1.131228	4.013410
precutter	728.8	2.077193	7.369537	787.8	1.948070	6.911431
total	765.8	42.99228	152.5295	857.2	24.06175	85.36712

Test No: 80-06-09
Date: 01-25-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: morena-s
Sweeper Type: iss

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
strips	30	40
cm wide	13.5	13.5
curb-km	.00405	.0054
curb-mi	.0025167	.0033556

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
pan	1.4			5.7		
38	7	.3456790	1.226390	7.7	1.055556	3.744870
63	19.3	2.074074	7.358342	14.6	2.481481	8.803731
125	52.2	6.839506	24.26501	48.4	5.185185	18.39585
500	39.9	19.72840	69.99185	35.1	14.14815	50.19440
2000	6.6	29.58025	104.9440	3.3	20.64815	73.25492
5600	1.3	31.20988	110.7255	.9	21.25926	75.42301
sieve sum	127.7	31.53086	111.8643	115.7	21.42593	76.01430
total before sieving	127.8	31.55556	111.9519	115.7	21.42593	76.01430

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.475	.475
vac. cfm:	72	72
curb-km	.0000267	.0000356
curb-mi	.0000166	.0000221

dia., aero.-microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
filter	.4			.2		
0.5	.1	.0149708	.0531138	.3	.0056140	.0199177
0.8	.1	.0187135	.0663922	.4	.0140351	.0497942
1.4	.5	.0224561	.0796707	1.2	.0252632	.0896295
2	2	.0411696	.1460629	2.5	.0589474	.2091355
4	2.6	.1160234	.4116318	4.6	.1291228	.4581064
11	8.5	.2133333	.7568714	13.1	.2582456	.9162127
stage 1	11.9	.5314620	1.885539	20.1	.6259649	2.220820
precutter	306.4	.9768421	3.465674	335.2	1.190175	4.222546
total	332.5	12.44444	44.15083	377.6	10.59930	37.60456

Test No: 80-06-10
Date: 01-26-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: morena-n
Sweeper Type: as

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	30 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.00405 curb-km
.0016778 curb-mi	.0025167 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	11.8			8.1		
38	127.7	4.370370	15.50508	99.6	2	7.095544
63	81.6	51.66667	183.3016	283.5	26.59259	94.34446
125	79.7	81.88889	290.5231	101.9	96.59259	342.6885
500	56.6	111.4074	395.2481	47.6	121.7531	431.9522
2000	10	132.3704	469.6199	7.1	133.5062	473.6495
5600	3.1	136.0741	482.7598	.4	135.2593	479.8690
sieve sum	370.5	137.2222	486.8332	548.2	135.3580	480.2194
total before sieving	372.1	137.8148	488.9355	547.3	135.1358	479.4310

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000178 curb-km	.0000267 curb-km
.0000111 curb-mi	.0000166 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.2			0		
0.5	.2	.0112281	.0398353	.3	0	0
0.8	.6	.0224561	.0796707	1.7	.0112281	.0398353
1.4	4	.0561404	.1991767	7.2	.0748538	.2655689
2	13.1	.2807018	.9958834	28.5	.3443275	1.221617
4	35	1.016140	3.605098	172.8	1.410994	5.005974
11	40.1	2.981053	10.57628	114.5	7.878363	27.95113
stage 1	26.3	5.232281	18.56327	81.2	12.16374	43.15495
precutter	1088.2	6.708772	23.80161	1849.6	15.20281	53.93704
total	1207.7	67.80070	240.5457	2255.8	84.42760	299.5352

Test No: 80-06-11
Date: 01-31-83
Sample type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-w
Sweeper Type: iss

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
	10 strips	10 strips
	13.5 cm wide	13.5 cm wide
	.00135 curb-km	.00135 curb-km
	.0008389 curb-mi	.0008389 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	5.9			5.8		
38	5.8	4.370370	15.50508	16.6	4.296296	15.24228
63	54.6	8.666667	30.74736	63.5	16.59259	58.86674
125	611.2	49.11111	174.2350	443.2	63.62963	225.7434
500	83.3	501.8519	1780.456	34.9	391.9259	1390.464
2000	14	563.5556	1999.367	1.3	417.7778	1482.180
5600	2.9	573.9259	2036.158	.3	418.7407	1485.597
sieve sum	777.7	576.0741	2043.779	565.6	418.9630	1486.385
total before sieving	777.7	576.0741	2043.779	565.3	418.7407	1485.597

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
	c.i. cfm: .475	c.i. cfm: .475
	vac. cfm: 72	vac. cfm: 72
	.0000089 curb-km	.0000089 curb-km
	.0000055 curb-mi	.0000055 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.2			.2		
0.5	.3	.0224561	.0796707	.4	.0224561	.0796707
0.8	3.8	.0561404	.1991767	1.5	.0673684	.2390120
1.4	16.5	.4828070	1.712919	6.6	.2357895	.8365421
2	13.9	2.335439	8.285750	10.2	.9768421	3.465674
4	23.5	3.896140	13.82286	16.1	2.122105	7.528878
11	22.9	6.534737	23.18417	23.4	3.929825	13.94237
stage 1	15.9	9.105965	32.30646	17.1	6.557193	23.26384
precutter	2499.6	10.89123	38.64028	1448.2	8.477193	30.07568
total	2596.6	291.5481	1034.364	1523.7	171.0821	606.9710

Test No: 80-07-01
Date: 02-01-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: morena-s
Sweeper Type: iss

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
strips	40	60
cm wide	13.5	13.5
curb-km	.0054	.0081
curb-mi	.0033556	.0050333

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	5.7			7.9		
38	20.4	1.055556	3.744870	21.4	.9753086	3.460173
63	47.4	4.833333	17.14756	35.4	3.617284	12.83330
125	84	13.61111	48.28912	59.3	7.987654	28.33838
500	41.4	29.16667	103.4767	32.9	15.30864	54.31157
2000	7.7	36.83333	130.6763	4.6	19.37037	68.72166
5600	4.8	38.25926	135.7351	0	19.93827	70.73644
sieve sum	211.4	39.14815	138.8887	161.5	19.93827	70.73644
total before sieving	211.2	39.11111	138.7573	161	19.87654	70.51744

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.475	.475
vac. cfm:	72	72
curb-km	.0000356	.0000534
curb-mi	.0000221	.0000332

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.1		
0.5	.1	0	0	.4	.0018713	.0066392
0.8	.3	.0028070	.0099588	.9	.0093567	.0331961
1.4	.9	.0112281	.0398353	2.1	.0261988	.0929491
2	2.6	.0364912	.1294648	3.8	.0654971	.2323728
4	8.1	.1094737	.3883945	8.5	.1366082	.4846633
11	36.3	.3368421	1.195060	32.2	.2956725	1.048997
stage 1	27.2	1.355789	4.810117	25.8	.8982456	3.186827
precutter	721.9	2.119298	7.518920	532.8	1.381053	4.899746
total	797.4	22.38316	79.41174	606.6	11.35158	40.27352

```
        Test No:  80-07-02
              Date:  02-09-83
       Sample Type:  [          ] 8 ft. Sweeping Lane
                     [    x     ] Half of Street
          Location:  morena-s
      Sweeper Type:  iss

                     INITIAL                            RESIDUAL

                           VACUUM CLEANER SAMPLES
                          20 strips                           40 strips
                        13.5 cm wide                        13.5 cm wide
                       .0027 curb-km                       .0054 curb-km
                    .0016778 curb-mi                    .0033556 curb-mi

                     ----cumulative----                 ----cumulative----
            sieve    ---smaller than---        sieve    ---smaller than---
dia.,         wt.,   kg/        lb/              wt.,   kg/        lb/
microns        g       curb-km   curb-mi          g       curb-km   curb-mi

pan            8.3                                6.8
38            10.7  3.074074  10.90611           12.3  1.259259  4.467565
63              23  7.037037  24.96580           21.9  3.537037  12.54860
125           55.4  15.55556  55.18756           39.3  7.592593  26.93679
500           27.1  36.07407  127.9826           24.9  14.87037  52.75668
2000          10.1  46.11111  163.5917            8.6  19.48148  69.11586
5600           4.4  49.85185  176.8630             .4  21.07407  74.76601
sieve sum      139  51.48148  182.6446          114.2  21.14815  75.02881
total        139.4  51.62963  183.1702          114.1  21.12963  74.96311
 before
 sieving

                          CASCADE IMPACTOR SAMPLES
                     c.i. cfm:       .475               c.i. cfm:       .475
                     vac. cfm:         72               vac. cfm:         72
                      .0000178 curb-km                   .0000356 curb-km
                      .0000111 curb-mi                   .0000221 curb-mi

                     ----cumulative----                 ----cumulative----
dia.,         stage  ---smaller than---         stage   ---smaller than---
aero.-         wt.,  kg/        lb/              wt.,   kg/        lb/
microns         mg     curb-km   curb-mi           mg     curb-km   curb-mi

filter           0                                 .1
0.5             .1         0         0             .1  .0028070  .0099588
0.8             .1  .0056140  .0199177             .3  .0056140  .0199177
1.4             .6  .0112281  .0398353              1  .0140351  .0497942
2              2.2  .0449123  .1593413            2.6  .0421053  .1493825
4              6.5  .1684211  .5975300            5.4  .1150877  .4083122
11            23.2  .5333333  1.892178           20.6  .2666667  .9460892
stage 1       12.4  1.835789  6.513077           21.7  .8449123  2.997609
precutter    408.7  2.531930  8.982868          389.6  1.454035  5.158676
total        453.8  25.47649  90.38638          441.4  12.39018  43.95829
```

Test No: 80-07-03
Date: 02-10-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-w
Sweeper Type: as

INITIAL | RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL:
10 strips
13.5 cm wide
.00135 curb-km
.0008389 curb-mi

RESIDUAL:
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

	INITIAL	----cumulative---- ---smaller than---		RESIDUAL	----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	2.6			5.9		
38	11.8	1.925926	6.832746	9	2.185185	7.752539
63	71	10.66667	37.84290	38.3	5.518519	19.57845
125	702.6	63.25926	224.4294	183.6	19.70370	69.90425
500	43.4	583.7037	2070.848	7.9	87.70370	311.1527
2000	1.5	615.8519	2184.902	.5	90.62963	321.5333
5600	.6	616.9630	2188.844	0	90.81481	322.1903
sieve sum	833.5	617.4074	2190.421	245.2	90.81481	322.1903
total before sieving	834.3	618	2192.523	245.5	90.92593	322.5845

CASCADE IMPACTOR SAMPLES

INITIAL:
c.i. cfm: .475
vac. cfm: 72
.0000089 curb-km
.0000055 curb-mi

RESIDUAL:
c.i. cfm: .475
vac. cfm: 72
.0000178 curb-km
.0000111 curb-mi

	INITIAL	----cumulative---- ---smaller than---		RESIDUAL	----cumulative---- ---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.4			.1		
0.5	0	.0449123	.1593413	.2	.0056140	.0199177
0.8	.3	.0449123	.1593413	0	.0168421	.0597530
1.4	.9	.0785965	.2788474	.8	.0168421	.0597530
2	3.2	.1796491	.6373654	1	.0617544	.2190943
4	15.3	.5389474	1.912096	3.3	.1178947	.4182710
11	38.4	2.256842	8.006903	19	.3031579	1.075554
stage 1	19.4	6.568421	23.30367	20.3	1.369825	4.859911
precutter	2767.7	8.746667	31.03173	708.8	2.509474	8.903198
total	2845.6	319.5060	1133.554	753.5	42.30175	150.0796

Test No: 80-07-04
Date: 02-14-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-w
Sweeper Type: bsb

	INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

20 strips	20 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0027 curb-km
.0016778 curb-mi	.0016778 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	10.7			9.3		
38	28	3.962963	14.05969	22.5	3.444444	12.22010
63	91	14.33333	50.85140	57.2	11.77778	41.78487
125	489.4	48.03704	170.4245	186.3	32.96296	116.9451
500	44.2	229.2963	813.4910	11.7	101.9630	361.7413
2000	5.2	245.6667	871.5693	3	106.2963	377.1150
5600	1.1	247.5926	878.4021	2.7	107.4074	381.0570
sieve sum	669.6	248	879.8475	292.7	108.4074	384.6048
total before sieving	669.6	248	879.8475	292.5	108.3333	384.3420

CASCADE IMPACTOR SAMPLES

c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000178 curb-km	.0000178 curb-km
.0000111 curb-mi	.0000111 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.5	.2	.0056140	.0199177	.3	0	0
0.8	.3	.0168421	.0597530	.3	.0168421	.0597530
1.4	1.6	.0336842	.1195060	1.2	.0336842	.1195060
2	5.3	.1235088	.4381887	3.4	.1010526	.3585180
4	15.3	.4210526	1.493825	8.6	.2919298	1.035719
11	66.1	1.28	4.541228	25.5	.7747368	2.748638
stage 1	26.6	4.990877	17.70681	39.2	2.206316	7.827643
precutter	2560.7	6.484211	23.00491	991	4.407018	15.63537
total	2676.2	150.2428	533.0366	1069.5	60.04211	213.0195

Test No: 80-07-05
Date: 02-15-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-e
Sweeper Type: iss

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL:
5 strips
13.5 cm wide
.000675 curb-km
.0004194 curb-mi

RESIDUAL:
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
pan	5.6			9.6		
38	12.2	8.296296	29.43337	15.1	1.777778	6.307150
63	73.7	26.37037	93.55606	35.3	4.574074	16.22777
125	587.6	135.5556	480.9202	106.7	11.11111	39.41969
500	25.1	1006.074	3569.321	8.8	30.87037	109.5210
2000	3.1	1043.259	3701.246	2.5	32.5	115.3026
5600	2.2	1047.852	3717.539	.7	32.96296	116.9451
sieve sum	709.5	1051.111	3729.103	178.7	33.09259	117.4050
total before sieving	708.6	1049.778	3724.372	178	32.96296	116.9451

CASCADE IMPACTOR SAMPLES

INITIAL:
c.i. cfm: .475
vac. cfm: 72
.0000045 curb-km
.0000028 curb-mi

RESIDUAL:
c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

dia., aero.-microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
filter	.1			.2		
0.5	.1	.0224561	.0796707	.2	.0056140	.0199177
0.8	.2	.0449123	.1593413	.7	.0112281	.0398353
1.4	.5	.0898246	.3186827	1.7	.0308772	.1095472
2	1.7	.2021053	.7170360	5.3	.0785965	.2788474
4	5.9	.5838596	2.071437	8.7	.2273684	.8066656
11	27	1.908772	6.772007	14.8	.4715789	1.673084
stage 1	27.3	7.971930	28.28309	25.4	.8870175	3.146992
precutter	2075.4	14.10246	50.03318	603.5	1.6	5.676535
total	2138.2	480.1572	1703.518	660.5	18.54035	65.77810

```
     Test No:  80-07-06
        Date:  02-16-83
 Sample Type:  [          ] 8 ft. Sweeping Lane
               [    x     ] Half of Street
    Location:  morena-s
Sweeper Type:  as


                     INITIAL                           RESIDUAL

                          VACUUM CLEANER SAMPLES
                         30 strips                          40 strips
                       13.5 cm wide                       13.5 cm wide
                     .00405 curb-km                      .0054 curb-km
                   .0025167 curb-mi                   .0033556 curb-mi

                     ----cumulative----                ----cumulative----
               sieve ---smaller than---         sieve  ---smaller than---
dia.,           wt., kg/       lb/               wt.,  kg/       lb/
microns           g    curb-km  curb-mi            g     curb-km  curb-mi

pan             2.9                               7.7
38             10.6  .7160494 2.540380            7.2 1.425926 5.058860
63             21.7  3.333333 11.82591           12.1 2.759259 9.789223
125            57.4  8.691358 30.83496           27.8        5 17.73886
500            38.7  22.86420 81.11696             17 10.14815 36.00332
2000            5.7  32.41975 115.0179            2.1 13.29630 47.17223
5600            1.6  33.82716 120.0111             .8 13.68519 48.55192
sieve sum     138.6  34.22222 121.4126           74.7 13.83333 49.07751
total         138.2  34.12346 121.0622           74.5 13.79630 48.94611
 before
 sieving

                          CASCADE IMPACTOR SAMPLES
                     c.i. cfm:      .475               c.i. cfm:      .475
                     vac. cfm:        72               vac. cfm:        72
                      .0000267 curb-km                  .0000356 curb-km
                      .0000166 curb-mi                  .0000221 curb-mi

                     ----cumulative----                ----cumulative----
dia.,          stage ---smaller than---         stage  ---smaller than---
aero.-          wt., kg/       lb/               wt.,  kg/       lb/
microns           mg   curb-km  curb-mi            mg    curb-km  curb-mi

filter            0                                 0
0.5              .1         0        0              0        0        0
0.8              .3 .0037427 .0132784              .2        0        0
1.4              .7 .0149708 .0531138              .7 .0056140 .0199177
2               2.6 .0411696 .1460629             1.8 .0252632 .0896295
4               5.3 .1384795 .4913025             3.4 .0757895 .2688885
11             16.1 .3368421 1.195060             6.9 .1712281 .6074889
stage 1        20.5 .9394152 3.332890              19 .3649123 1.294648
precutter     438.5 1.706667 6.054971           247.9 .8982456 3.186827
total         484.1 18.11836 64.28095           279.9 7.856842 27.87478
```

```
       Test No:  80-07-07
          Date:  02-17-83
   Sample Type:  [         ] 8 ft. Sweeping Lane
                 [    x    ] Half of Street
      Location:  mission-w
  Sweeper Type:  as


                 INITIAL                           RESIDUAL

                          VACUUM CLEANER SAMPLES
                        20 strips                            40 strips
                      13.5 cm wide                         13.5 cm wide
                     .0027 curb-km                        .0054 curb-km
                  .0016778 curb-mi                     .0033556 curb-mi

                 ----cumulative----                ----cumulative----
          sieve  ---smaller than---         sieve  ---smaller than---
dia.,      wt.,  kg/      lb/                wt.,  kg/      lb/
microns     g      curb-km  curb-mi           g      curb-km  curb-mi

pan         8.5                              16.7
38         23.4 3.148148 11.16891            16.8 3.092593 10.97181
63         52.1 11.81481 41.91627              53 6.203704 22.00933
125       165.1 31.11111 110.3751           135.6 16.01852 56.83005
500        11.5 92.25926 327.3148             9.6 41.12963 145.9185
2000         .8 96.51852 342.4257             1.2 42.90741 152.2257
5600         .2 96.81481 343.4769              .3 43.12963 153.0141
sieve sum 261.6 96.88889 343.7397           233.2 43.18519 153.2112
total     261.1 96.70370 343.0827           232.9 43.12963 153.0141
 before
 sieving

                          CASCADE IMPACTOR SAMPLES
                 c.i. cfm:     .475                c.i. cfm:     .475
                 vac. cfm:       72                vac. cfm:       72
                  .0000178 curb-km                  .0000356 curb-km
                  .0000111 curb-mi                  .0000221 curb-mi

                 ----cumulative----                ----cumulative----
dia.,     stage  ---smaller than---        stage   ---smaller than---
aero.-     wt.,  kg/      lb/               wt.,   kg/      lb/
microns     mg     curb-km  curb-mi          mg      curb-km  curb-mi

filter       .2                               .2
0.5          .1 .0112281 .0398353             .1 .0056140 .0199177
0.8          .4 .0168421 .0597530             .8 .0084211 .0298765
1.4         1.3 .0392982 .1394237            1.4 .0308772 .1095472
2           2.6 .1122807 .3983534            4.1 .0701754 .2489708
4             6 .2582456 .9162127           18.4 .1852632 .6572830
11         28.9 .5950877 2.111273           38.6 .7017544 2.489708
stage 1    34.8 2.217544 7.867479           22.5 1.785263 6.333818
precutter 989.6 4.171228 14.79883          895.6 2.416842 8.574556
total    1063.9 59.72772 211.9041          981.7 27.55649 97.76587
```

Test No: 80-07-08
Date: 02-18-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-e
Sweeper Type: bsa

INITIAL | RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL:
5 strips
13.5 cm wide
.000675 curb-km
.0004194 curb-mi

RESIDUAL:
15 strips
13.5 cm wide
.002025 curb-km
.0012583 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	1			2.4		
38	3	1.481481	5.255959	6.4	1.185185	4.204767
63	22.2	5.925926	21.02383	29.5	4.345679	15.41748
125	176.3	38.81481	137.7061	115.9	18.91358	67.10107
500	7.5	300	1064.332	5.3	76.14815	270.1563
2000	1.2	311.1111	1103.751	1	78.76543	279.4418
5600	2.6	312.8889	1110.058	1.2	79.25926	281.1938
sieve sum	213.8	316.7407	1123.724	161.7	79.85185	283.2962
total before sieving	213.3	316	1121.096	161.1	79.55556	282.2450

CASCADE IMPACTOR SAMPLES

INITIAL:
c.i. cfm: .475
vac. cfm: 72
.0000045 curb-km
.0000028 curb-mi

RESIDUAL:
c.i. cfm: .475
vac. cfm: 72
.0000134 curb-km
.0000083 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	0			0		
0.5	0	0	0	0	0	0
0.8	0	0	0	.1	0	0
1.4	.1	0	0	.7	.0074854	.0265569
2	.4	.0224561	.0796707	1.6	.0598830	.2124551
4	.5	.1122807	.3983534	2.5	.1796491	.6373654
11	4.7	.2245614	.7967067	6.6	.3667836	1.301288
stage 1	10.1	1.28	4.541228	13.1	.8608187	3.054042
precutter	700	3.548070	12.58797	417.5	1.841404	6.532995
total	715.8	160.7411	570.2827	442.1	33.09287	117.4080

```
     Test No:  80-07-09
          Date:  02-22-83
   Sample Type:  [          ] 8 ft. Sweeping Lane
                 [    x     ] Half of Street
      Location:  morena-s
  Sweeper Type:  bsb


                       INITIAL                              RESIDUAL

                                   VACUUM CLEANER SAMPLES
                             20 strips                               40 strips
                           13.5 cm wide                            13.5 cm wide
                          .0027 curb-km                           .0054 curb-km
                       .0016778 curb-mi                        .0033556 curb-mi

                      ----cumulative----                     ----cumulative----
             sieve    ---smaller than---         sieve       ---smaller than---
dia.,          wt.,   kg/        lb/               wt.,      kg/        lb/
microns         g       curb-km  curb-mi            g          curb-km  curb-mi

pan                6.8                                  6.6
38                   5 2.518519 8.935130               14.1 1.222222 4.336166
63                 8.9 4.370370 15.50508                 23 3.833333 13.59979
125                 23 7.666667 27.19959               43.1 8.092593 28.71067
500               16.8 16.18519 57.42135               27.6 16.07407 57.02715
2000               3.3 22.40741 79.49637                4.4 21.18519 75.16021
5600               1.5 23.62963 83.83254                1.2 22.00000 78.05098
sieve sum         65.3 24.18519 85.80352                120 22.22222 78.83938
total             64.9 24.03704 85.27793              119.8 22.18519 78.70798
 before
 sieving

                                  CASCADE IMPACTOR SAMPLES
                     c.i. cfm:      .475                    c.i. cfm:      .475
                     vac. cfm:        72                    vac. cfm:        72
                      .0000178 curb-km                       .0000356 curb-km
                      .0000111 curb-mi                       .0000221 curb-mi

                     ----cumulative----                     ----cumulative----
dia.,         stage  ---smaller than---          stage      ---smaller than---
aero.-         wt.,  kg/        lb/               wt.,      kg/        lb/
microns         mg     curb-km  curb-mi            mg          curb-km  curb-mi

filter            0                                   0
0.5              .1         0         0               0         0         0
0.8              .2 .0056140 .0199177                .3         0         0
1.4              .4 .0168421 .0597530               1.2 .0084211 .0298765
2               1.4 .0392982 .1394237               2.6 .0421053 .1493825
4               2.2 .1178947 .4182710               7.3 .1150877 .4083122
11              5.7 .2414035 .8564597              14.1       .32 1.135307
stage 1        14.8 .5614035 1.991767              31.1 .7157895 2.539503
precutter     133.3 1.392281 4.939582             322.3 1.588772 5.636700
total         158.1 8.875789 31.48983             378.9 10.63579 37.73402
```

Test No: 80-07-10
Date: 02-23-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: morena-n
Sweeper Type: iss

INITIAL — RESIDUAL

VACUUM CLEANER SAMPLES

Initial: 5 strips, 13.5 cm wide, .000675 curb-km, .0004194 curb-mi

Residual: 20 strips, 13.5 cm wide, .0027 curb-km, .0016778 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	54			96.1		
38	151.7	80	283.8218	49.8	35.59259	126.2744
63	135.6	304.7407	1081.151	69.6	54.03704	191.7111
125	174	505.6296	1793.859	83.7	79.81481	283.1648
500	160	763.4074	2708.395	87.4	110.8148	393.1457
2000	75.8	1000.444	3549.349	65.5	143.1852	507.9884
5600	29.9	1112.741	3947.750	40.1	167.4444	594.0547
sieve sum	781	1157.037	4104.904	492.2	182.2963	646.7457
total before sieving	781.4	1157.630	4107.006	491.8	182.1481	646.2201

CASCADE IMPACTOR SAMPLES

Initial: c.i. cfm: .475; vac. cfm: 72; .0000045 curb-km; .0000028 curb-mi

Residual: c.i. cfm: .475; vac. cfm: 72; .0000178 curb-km; .0000111 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.2			.2		
0.5	.3	.0449123	.1593413	.6	.0112281	.0398353
0.8	3.2	.1122807	.3983534	2.8	.0449123	.1593413
1.4	7.8	.8308772	2.947815	7.4	.2021053	.7170360
2	19.3	2.582456	9.162127	15.7	.6175439	2.190943
4	123.1	6.916491	24.53857	49.1	1.498947	5.318017
11	180	34.56	122.6132	34.8	4.255439	15.09759
stage 1	51.4	74.98105	266.0204	169.4	6.209123	22.02894
precutter	2093.8	86.52351	306.9711	1212.2	15.71930	55.76947
total	2479.1	556.7102	1975.116	1492.2	83.77263	297.2114

Test No: 80-13-01
Date: 08-16-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-e
Sweeper Type: bsb

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
strips	10	40
cm wide	13.5	13.5
curb-km	.00135	.0054
curb-mi	.0008389	.0033556

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	13.6			11.7		
38	25.2	10.07407	35.74052	36.6	2.166667	7.686839
63	78.1	28.74074	101.9656	118.9	8.944444	31.73285
125	371.9	86.59259	307.2108	426.1	30.96296	109.8495
500	43.7	362.0741	1284.556	37.8	109.8704	389.7950
2000	5.2	394.4444	1399.399	5.5	116.8704	414.6294
5600	2.4	398.2963	1413.064	3.6	117.8889	418.2429
sieve sum	540.1	400.0741	1419.372	640.2	118.5556	420.6081
total before sieving	540.9	400.6667	1421.474	640.3	118.5741	420.6738

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.488	.404
vac. cfm:	72	72
curb-km	.0000092	.0000303
curb-mi	.0000057	.0000188

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.2		
0.5	.1	0	0	.3	.0066007	.0234181
0.8	.5	.0109290	.0387741	1	.0165017	.0585451
1.4	1.4	.0655738	.2326449	2.8	.0495050	.1756354
2	3.7	.2185792	.7754830	4.7	.1419142	.5034881
4	16.5	.6229508	2.210126	10.9	.2970297	1.053812
11	45.5	2.426230	8.607861	30	.6567657	2.330096
stage 1	35	7.398907	26.25010	62	1.646865	5.842804
precutter	1829.6	11.22404	39.82105	1852.9	3.693069	13.10240
total	1932.3	211.1803	749.2329	1964.8	64.84488	230.0589

Test No: 80-13-02
Date: 08-17-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: morena-s
Sweeper Type: bsb

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	40 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0054 curb-km
.0016778 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than---		sieve wt., g	----cumulative---- ---smaller than---	
		kg/ curb-km	lb/ curb-mi		kg/ curb-km	lb/ curb-mi
pan	6.2			22.2		
38	15.9	2.296296	8.146736	38.9	4.111111	14.58529
63	43	8.185185	29.03917	113.5	11.31481	40.14238
125	107.8	24.11111	85.54073	310.7	32.33333	114.7113
500	52.5	64.03704	227.1888	139	89.87037	318.8396
2000	18.1	83.48148	296.1733	20.3	115.6111	410.1619
5600	11.7	90.18519	319.9565	14.7	119.3704	423.4989
sieve sum	255.2	94.51852	335.3302	659.3	122.0926	433.1567
total before sieving	254.8	94.37037	334.8046	658.2	121.8889	432.4340

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000178 curb-km	.0000356 curb-km
.0000111 curb-mi	.0000221 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than---		stage wt., mg	----cumulative---- ---smaller than---	
		kg/ curb-km	lb/ curb-mi		kg/ curb-km	lb/ curb-mi
filter	.1			.3		
0.5	0	.0056140	.0199177	.3	.0084211	.0298765
0.8	.4	.0056140	.0199177	1.2	.0168421	.0597530
1.4	.9	.0280702	.0995883	3.3	.0505263	.1792590
2	2.8	.0785965	.2788474	12.5	.1431579	.5079005
4	6.3	.2357895	.8365421	26.3	.4940351	1.752755
11	24.2	.5894737	2.091355	72.4	1.232281	4.371928
stage 1	27.2	1.948070	6.911431	88.6	3.264561	11.58212
precutter	552.9	3.475088	12.32904	2660.9	5.751579	20.40565
total	614.8	34.51509	122.4538	2865.8	80.44351	285.4003

```
     Test No:  80-13-03
           Date:  08-19-83
    Sample Type: [          ] 8 ft. Sweeping Lane
                 [    x     ] Half of Street
       Location:  mission-e
   Sweeper Type:  bsa

                  INITIAL                           RESIDUAL

                              VACUUM CLEANER SAMPLES
                        10 strips                            40 strips
                      13.5 cm wide                         13.5 cm wide
                    .00135 curb-km                        .0054 curb-km
                  .0008389 curb-mi                     .0033556 curb-mi

                  ----cumulative----                ----cumulative----
            sieve ---smaller than---        sieve   ---smaller than---
dia.,         wt., kg/       lb/              wt.,   kg/       lb/
microns        g     curb-km  curb-mi          g       curb-km  curb-mi

pan           6.5                             9.6
38           10.7 4.814815 17.08187          26.4 1.777778 6.307150
63           36.8 12.74074 45.20124          94.1 6.666667 23.65181
125         189.7       40 141.9109         298.8 24.09259 85.47503
500          26.3 180.5185 640.4386          23.8 79.42593 281.7851
2000          4.3      200 709.5544           6.1 83.83333 297.4216
5600            4 203.1852 720.8547           9.9 84.96296 301.4292
sieve sum   278.3 206.1481 731.3666         468.7 86.79630 307.9335
total       277.8 205.7778 730.0526         468.8 86.81481 307.9992
 before
 sieving

                            CASCADE IMPACTOR SAMPLES
                  c.i. cfm:      .475               c.i. cfm:      .475
                  vac. cfm:        72               vac. cfm:        72
                   .0000089 curb-km                  .0000356 curb-km
                   .0000055 curb-mi                  .0000221 curb-mi

                  ----cumulative----                ----cumulative----
dia.,        stage ---smaller than---         stage ---smaller than---
aero.-        wt., kg/       lb/               wt., kg/       lb/
microns        mg    curb-km  curb-mi           mg    curb-km  curb-mi

filter          0                               .1
0.5            .1        0        0             .4 .0028070 .0099588
0.8            .3 .0112281 .0398353             .9 .0140351 .0497942
1.4           1.1 .0449123 .1593413            4.6 .0392982 .1394237
2             2.6 .1684211 .5975300           14.1 .1684211 .5975300
4             6.5 .4603509 1.633249           25.5 .5642105 2.001726
11           22.8 1.190175 4.222546           49.8     1.28 4.541228
stage 1      19.3 3.750175 13.30500             43 2.677895 9.500728
precutter       0 5.917193 20.99322              0 3.884912 13.78303
total        52.7 5.917193 20.99322          138.4 3.884912 13.78303

*** Precutter samples were lost. ***
```

Test No: 80-13-04
Date: 08-22-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-w
Sweeper Type: iss

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
strips	10	30
cm wide	13.5	13.5
curb-km	.00135	.00405
curb-mi	.0008389	.0025167

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
pan	4.7			6.1		
38	20.4	3.481481	12.35150	21.8	1.506173	5.343558
63	62.9	18.59259	65.96228	58.1	6.888889	24.44021
125	227.3	65.18519	231.2622	188.8	21.23457	75.33541
500	45.9	233.5556	828.6019	67.6	67.85185	240.7229
2000	4.8	267.5556	949.2261	20.6	84.54321	299.9400
5600	.8	271.1111	961.8404	5.7	89.62963	317.9855
sieve sum	366.8	271.7037	963.9428	368.7	91.03704	322.9787
total before sieving	366.5	271.4815	963.1544	368	90.86420	322.3655

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.475	.475
vac. cfm:	72	72
curb-km	.0000089	.0000267
curb-mi	.0000055	.0000166

dia., aero.-microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
filter	0			.1		
0.5	0	0	0	.3	.0037427	.0132784
0.8	.8	0	0	1.5	.0149708	.0531138
1.4	2	.0898246	.3186827	3.9	.0711111	.2522905
2	5.5	.3143860	1.115389	9.6	.2170760	.7701498
4	16.5	.9319298	3.306333	24.1	.5763743	2.044881
11	39.7	2.784561	9.879163	54.9	1.478363	5.244986
stage 1	35	7.242105	25.69379	50.2	3.533099	12.53485
precutter	1616.2	11.17193	39.63616	1644.9	5.411930	19.20063
total	1715.7	192.64	683.4549	1789.5	66.97544	237.6178

Test No: 80-13-05
Date: 08-23-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: morena-s
Sweeper Type: bsb

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
strips	20	40
cm wide	13.5	13.5
curb-km	.0027	.0054
curb-mi	.0016778	.0033556

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	1.4			1.4		
38	10.4	.5185185	1.839585	26.5	.2592593	.9197927
63	38.3	4.370370	15.50508	92	5.166667	18.33016
125	104.5	18.55556	65.83088	218.8	22.20370	78.77368
500	44.3	57.25926	203.1428	91.5	62.72222	222.5241
2000	9.5	73.66667	261.3525	14.2	79.66667	282.6392
5600	3.2	77.18519	273.8354	3.1	82.29630	291.9685
sieve sum	211.6	78.37037	278.0402	447.5	82.87037	294.0052
total before sieving	210.9	78.11111	277.1204	447.7	82.90741	294.1366

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.475	.475
vac. cfm:	72	72
curb-km	.0000178	.0000356
curb-mi	.0000111	.0000221

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
6filter	.1			.3		
0.5	.1	.0056140	.0199177	0	.0084211	.0298765
0.8	.5	.0112281	.0398353	1	.0084211	.0298765
1.4	1.2	.0392982	.1394237	3.1	.0364912	.1294648
2	3.7	.1066667	.3784357	7.1	.1235088	.4381887
4	8.5	.3143860	1.115389	20.9	.3228070	1.145266
11	53.3	.7915789	2.808391	66.4	.9094737	3.226662
stage 1	23	3.783860	13.42451	52.1	2.773333	9.839328
precutter	925.4	5.075088	18.00557	2141.1	4.235789	15.02788
total	1015.8	57.02737	202.3237	2292	64.33684	228.2565

Test No: 80-13-06
Date: 08-24-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: mission-w
Sweeper Type: as

VACUUM CLEANER SAMPLES

INITIAL
15 strips
13.5 cm wide
.002025 curb-km
.0012583 curb-mi

RESIDUAL
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	4.6			5.5		
38	24.2	2.271605	8.059136	32.8	1.018519	3.613472
63	78.3	14.22222	50.45720	99.1	7.092593	25.16290
125	221.3	52.88889	187.6377	206.2	25.44444	90.27109
500	41	162.1728	575.3523	59.5	63.62963	225.7434
2000	8.4	182.4198	647.1837	14.1	74.64815	264.8346
5600	.7	186.5679	661.9004	2.5	77.25926	274.0982
sieve sum	378.5	186.9136	663.1268	419.7	77.72222	275.7407
total before sieving	377.7	186.5185	661.7252	419.9	77.75926	275.8721

CASCADE IMPACTOR SAMPLES

INITIAL
c.i. cfm: .475
vac. cfm: 72
.0000134 curb-km
.0000083 curb-mi

RESIDUAL
c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	0			0		
0.5	0	0	0	.4	0	0
0.8	0	0	0	2.2	.0112281	.0398353
1.4	0	0	0	4.3	.0729825	.2589297
2	1.5	0	0	12.7	.1936842	.6871595
4	16	.1122807	.3983534	37.4	.5501754	1.951931
11	71.2	1.309942	4.647456	57.6	1.6	5.676535
stage 1	47.4	6.639532	23.55596	51.7	3.216842	11.41282
precutter	104.6	10.18760	36.14393	1965.3	4.668070	16.56154
total	240.7	18.01731	63.92244	2131.6	59.83439	212.2825

Test No: 80-13-07
Date: 09-02-83
Sample Type: [ ] 8 ft. Sweeping Lane
[x] Half of Street
Location: morena-s
Sweeper Type: iss

INITIAL — RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
15 strips	60 strips
13.5 cm wide	13.5 cm wide
.002025 curb-km	.0081 curb-km
.0012583 curb-mi	.0050333 curb-mi

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
pan	5.1			5.5		
38	9.4	2.518519	8.935130	17	.6790123	2.408981
63	22.7	7.160494	25.40380	33	2.777778	9.854922
125	72.7	18.37037	65.17389	86.1	6.851852	24.30881
500	35.5	54.27160	192.5433	57.4	17.48148	62.02031
2000	4.4	71.80247	254.7388	8.3	24.56790	87.16131
5600	2.6	73.97531	262.4475	1.8	25.59259	90.79668
sieve sum	152.4	75.25926	267.0027	209.1	25.81481	91.58508
total before sieving	152.4	75.25926	267.0027	208.8	25.77778	91.45368

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000134 curb-km	.0000534 curb-km
.0000083 curb-mi	.0000332 curb-mi

dia., aero.-microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
filter	.3			0		
0.5	.3	.0224561	.0796707	.5	0	0
0.8	.4	.0449123	.1593413	.9	.0093567	.0331961
1.4	1	.0748538	.2655689	2.1	.0261988	.0929491
2	2.9	.1497076	.5311378	5.5	.0654971	.2323728
4	6.6	.3667836	1.301288	16.2	.1684211	.5975300
11	18.4	.8608187	3.054042	32.2	.4715789	1.673084
stage 1	21.4	2.238129	7.940510	28.7	1.074152	3.810914
precutter	494.4	3.84	13.62368	720.8	1.611228	5.716371
total	545.7	40.84772	144.9210	806.9	15.09988	53.57189

APPENDIX E -- SAN DIEGO SWEEPING LANE DATA

Test No: 80-06-01
Date: 1-11-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-n
Sweeper Type: bsb

INITIAL | RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
40 strips	40 strips
13.5 cm wide	13.5 cm wide
.0054 curb-km	.0054 curb-km
.0033556 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	17.6			22		
38	73.5	3.259259	11.56311	112.1	4.074074	14.45389
63	97.6	16.87037	59.85223	80.2	24.83333	88.10301
125	164.1	34.94444	123.9749	102.5	39.68519	140.7940
500	192.9	65.33333	231.7878	68.3	58.66667	208.1360
2000	101.8	101.0556	358.5221	20.2	71.31481	253.0087
5600	33.2	119.9074	425.4041	25.6	75.05556	266.2800
sieve sum	680.7	126.0556	447.2164	430.9	79.79630	283.0991
total before sieving	680.6	126.0370	447.1507	433.6	80.29630	284.8730

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.475	c.i. cfm:	.475
vac. cfm:	72	vac. cfm:	72
.0000356 curb-km		.0000356 curb-km	
.0000221 curb-mi		.0000221 curb-mi	

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.5		
0.5	.1	0	0	.5	.0140351	.0497942
0.8	1.6	.0028070	.0099588	3.3	.0280702	.0995883
1.4	5.1	.0477193	.1693002	10	.1207018	.4282299
2	10.6	.1908772	.6772007	24.1	.4014035	1.424113
4	31.6	.4884211	1.732837	33.4	1.077895	3.824192
11	138.3	1.375439	4.879829	153.3	2.015439	7.150443
stage 1	45.4	5.257544	18.65290	65.3	6.318596	22.41734
precutter	1989.7	6.531930	23.17421	1420.3	8.151579	28.92045
total	2222.4	62.38316	221.3251	1710.7	48.01965	170.3658

Test No: 80-06-02
Date: 01-12-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-s
Sweeper Type: as

VACUUM CLEANER SAMPLES

INITIAL
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

RESIDUAL
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

	INITIAL			RESIDUAL		
dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	13			4.2		
38	18.7	2.407407	8.540933	12.3	.7777778	2.759378
63	32.6	5.870370	20.82674	13.7	3.055556	10.84041
125	112.5	11.90741	42.24477	27.8	5.592593	19.84124
500	60.4	32.74074	116.1567	10	10.74074	38.10570
2000	13.3	43.92593	155.8392	3.3	12.59259	44.67565
5600	8.4	46.38889	164.5772	2.8	13.20370	46.84373
sieve sum	258.9	47.94444	170.0960	74.1	13.72222	48.68332
total before sieving	259.8	48.11111	170.6873	75.4	13.96296	49.53741

CASCADE IMPACTOR SAMPLES

INITIAL
c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

RESIDUAL
c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

	INITIAL			RESIDUAL		
dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.1			.3		
0.5	.1	.0028070	.0099588	.3	.0084211	.0298765
0.8	.5	.0056140	.0199177	.7	.0168421	.0597530
1.4	1.6	.0196491	.0697118	1.3	.0364912	.1294648
2	5	.0645614	.2290532	3.3	.0729825	.2589297
4	9.2	.2049123	.7269949	6.7	.1656140	.5875712
11	19	.4631579	1.643208	11	.3536842	1.254813
stage 1	29.5	.9964912	3.535386	20.3	.6624561	2.350285
precutter	708.5	1.824561	6.473242	278.6	1.232281	4.371928
total	773.5	21.71228	77.03158	322.5	9.052632	32.11724

Test No: 80-06-03
Date: 01-13-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-w
Sweeper Type: bsb

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
strips	60	60
cm wide	13.5	13.5
curb-km	.0081	.0081
curb-mi	.0050333	.0050333

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	33.5			14.1		
38	48.7	4.135802	14.67288	43.8	1.740741	6.175751
63	137.8	10.14815	36.00332	97	7.148148	25.36000
125	274.7	27.16049	96.35924	149.7	19.12346	67.84567
500	47.6	61.07407	216.6769	12.4	37.60494	133.4137
2000	6.2	66.95062	237.5255	1.7	39.13580	138.8449
5600	2.1	67.71605	240.2411	.7	39.34568	139.5895
sieve sum	550.6	67.97531	241.1609	319.4	39.43210	139.8961
total before sieving	551.8	68.12346	241.6865	320.4	39.55556	140.3341

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.475	.475
vac. cfm:	72	72
curb-km	.0000534	.0000534
curb-mi	.0000332	.0000332

dia., aero.- microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.8			.3		
0.5	1	.0149708	.0531138	.4	.0056140	.0199177
0.8	3	.0336842	.1195060	1.2	.0130994	.0464746
1.4	3.6	.0898246	.3186827	3.6	.0355556	.1261452
2	7.4	.1571930	.5576947	8.9	.1029240	.3651572
4	16.8	.2956725	1.048997	19.6	.2694737	.9560481
11	53	.6100585	2.164387	46.9	.6362573	2.257336
stage 1	54.1	1.601871	5.683175	59.3	1.513918	5.371131
precutter	988.2	2.614269	9.274994	976.7	2.623626	9.308190
total	1127.9	21.10690	74.88379	1116.9	20.90105	74.15348

Test No: 80-06-04
Date: 01-14-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-e
Sweeper Type: bsa

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
	60 strips	60 strips
	13.5 cm wide	13.5 cm wide
	.0081 curb-km	.0081 curb-km
	.0050333 curb-mi	.0050333 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	12.3			9.6		
38	32.5	1.518519	5.387358	15.6	1.185185	4.204767
63	130	5.530864	19.62225	59.2	3.111111	11.03751
125	731.9	21.58025	76.56180	188.8	10.41975	36.96691
500	96	111.9383	397.1315	19.9	33.72840	119.6607
2000	15.4	123.7901	439.1791	3.4	36.18519	128.3768
5600	12.2	125.6914	445.9243	3.5	36.60494	129.8660
sieve sum	1030.3	127.1975	451.2678	300	37.03704	131.3990
total before sieving	1029.9	127.1481	451.0926	301.3	37.19753	131.9684

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
	c.i. cfm: .475	c.i. cfm: .475
	vac. cfm: 72	vac. cfm: 72
	.0000534 curb-km	.0000534 curb-km
	.0000332 curb-mi	.0000332 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.5			0		
0.5	.6	.0093567	.0331961	.2	0	0
0.8	.7	.0205848	.0730314	.7	.0037427	.0132784
1.4	3.3	.0336842	.1195060	1.8	.0168421	.0597530
2	9.7	.0954386	.3386004	4.3	.0505263	.1792590
4	30.2	.2769591	.9826050	10.1	.1309942	.4647456
11	92.3	.8421053	2.987650	17.1	.32	1.135307
stage 1	23.3	2.569357	9.115653	35.3	.64	2.270614
precutter	2882.8	3.005380	10.66259	806.6	1.300585	4.614260
total	3043.4	56.95251	202.0581	876.1	16.39485	58.16623

Test No: 80-06-05
Date: 01-18-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-e
Sweeper Type: iss

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
strips	20	60
cm wide	13.5	13.5
curb-km	.0027	.0081
curb-mi	.0016778	.0050333

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	2.5			9		
38	5.1	.9259259	3.284974	10.7	1.111111	3.941969
63	31.3	2.814815	9.986321	33.7	2.432099	8.628532
125	189.1	14.40741	51.11420	92.7	6.592593	23.38902
500	24.3	84.44444	299.5896	9.6	18.03704	63.99130
2000	6.7	93.44444	331.5196	2.7	19.22222	68.19606
5600	6.3	95.92593	340.3233	1	19.55556	69.37865
sieve sum	265.3	98.25926	348.6015	159.4	19.67901	69.81665
total before sieving	266.3	98.62963	349.9154	159.3	19.66667	69.77285

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.475	.475
vac. cfm:	72	72
curb-km	.0000178	.0000534
curb-mi	.0000111	.0000332

dia., aero.- microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.2		
0.5	0	0	0	.1	.0037427	.0132784
0.8	.3	0	0	.5	.0056140	.0199177
1.4	.5	.0168421	.0597530	1.2	.0149708	.0531138
2	1.6	.0449123	.1593413	4	.0374269	.1327845
4	2.9	.1347368	.4780240	9.2	.1122807	.3983534
11	8.3	.2975439	1.055636	15.5	.2844444	1.009162
stage 1	13	.7635088	2.708803	25.7	.5745029	2.038241
precutter	680.8	1.493333	5.298100	517.6	1.055439	3.744522
total	707.4	39.71368	140.8976	574	10.74152	38.10914

Test No: 80-06-06
Date: 01-20-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-w
Sweeper Type: as

VACUUM CLEANER SAMPLES

INITIAL
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

RESIDUAL
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	8.3			7.8		
38	19.5	3.074074	10.90611	22.3	1.444444	5.124560
63	73.9	10.29630	36.52891	83.4	5.574074	19.77554
125	183.3	37.66667	133.6327	145.9	21.01852	74.56891
500	14.5	105.5556	374.4870	5.9	48.03704	170.4245
2000	2.1	110.9259	393.5399	.9	49.12963	174.3007
5600	.9	111.7037	396.2993	1.1	49.29630	174.8920
sieve sum	302.5	112.0370	397.4819	267.3	49.50000	175.6147
total before sieving	303.7	112.4815	399.0587	267.1	49.46296	175.4833

CASCADE IMPACTOR SAMPLES

INITIAL
c.i. cfm: .475
vac. cfm: 72
.0000178 curb-km
.0000111 curb-mi

RESIDUAL
c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.5	.2	.0056140	.0199177	.2	0	0
0.8	.5	.0168421	.0597530	.5	.0056140	.0199177
1.4	1	.0449123	.1593413	1.6	.0196491	.0697118
2	2.5	.1010526	.3585180	4.1	.0645614	.2290532
4	6.5	.2414035	.8564597	10.2	.1796491	.6373654
11	21	.6063158	2.151108	30.7	.4659649	1.653166
stage 1	28	1.785263	6.333818	31.3	1.327719	4.710528
precutter	965.7	3.357193	11.91077	887.5	2.206316	7.827643
total	1025.5	57.57193	204.2557	966.1	27.11860	96.21229

Test No: 80-06-07
Date: 01-21-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-e
Sweeper Type: bsa

	INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	40 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0054 curb-km
.0016778 curb-mi	.0033556 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	3.1			2.6		
38	10.1	1.148148	4.073368	9.1	.4814815	1.708187
63	67.6	4.888889	17.34466	66.9	2.166667	7.686839
125	572.6	29.92593	106.1704	214.6	14.55556	51.63979
500	45.3	242	858.5608	16.1	54.29630	192.6309
2000	5.1	258.7778	918.0846	1.7	57.27778	203.2085
5600	4.9	260.6667	924.7859	2.6	57.59259	204.3254
sieve sum	708.7	262.4815	931.2245	313.6	58.07407	206.0336
total before sieving	708.7	262.4815	931.2245	314.2	58.18519	206.4278

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000178 curb-km	.0000356 curb-km
.0000111 curb-mi	.0000221 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	0			0		
0.5	.2	0	0	0	0	0
0.8	.2	.0112281	.0398353	.4	0	0
1.4	1.2	.0224561	.0796707	.9	.0112281	.0398353
2	3.5	.0898246	.3186827	2.5	.0364912	.1294648
4	8.2	.2863158	1.015801	4.6	.1066667	.3784357
11	19.2	.7466667	2.649050	11.1	.2357895	.8365421
stage 1	13.4	1.824561	6.473242	20.8	.5473684	1.941973
precutter	1649.7	2.576842	9.142210	1115.4	1.131228	4.013410
total	1695.6	95.19158	337.7240	1155.7	32.44070	115.0942

Test No: 80-06-08
Date: 01-24-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-w
Sweeper Type: bsb

VACUUM CLEANER SAMPLES

INITIAL
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

RESIDUAL
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

dia., microns	INITIAL sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	RESIDUAL sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	2.1			3.3		
38	10	.7777778	2.759378	16	.6111111	2.168083
63	44	4.481481	15.89927	64.7	3.574074	12.68000
125	141.6	20.77778	73.71482	107.7	15.55556	55.18756
500	14.7	73.22222	259.7758	8.7	35.50000	125.9459
2000	1	78.66667	279.0914	1.3	37.11111	131.6618
5600	.2	79.03704	280.4054	0	37.35185	132.5159
sieve sum	213.6	79.11111	280.6682	201.7	37.35185	132.5159
total before sieving	213.7	79.14815	280.7996	201.7	37.35185	132.5159

CASCADE IMPACTOR SAMPLES

INITIAL
c.i. cfm: .475
vac. cfm: 72
.0000178 curb-km
.0000111 curb-mi

RESIDUAL
c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

dia., aero.-microns	INITIAL stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	RESIDUAL stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.5	.2	.0056140	.0199177	.1	0	0
0.8	.1	.0168421	.0597530	1	.0028070	.0099588
1.4	.7	.0224561	.0796707	1.5	.0308772	.1095472
2	2.3	.0617544	.2190943	3.4	.0729825	.2589297
4	3.6	.1908772	.6772007	7	.1684211	.5975300
11	12.1	.3929825	1.394237	15	.3649123	1.294648
stage 1	16.6	1.072281	3.804275	34.9	.7859649	2.788474
precutter	739.7	2.004211	7.110607	713.4	1.765614	6.264107
total	775.4	43.53123	154.4416	776.3	21.79088	77.31043

Test No: 80-06-09
Date: 01-25-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-s
Sweeper Type: iss

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

30 strips
13.5 cm wide
.00405 curb-km
.0025167 curb-mi

40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	.8			1.6		
38	5.4	.1975309	.7007945	4.3	.2962963	1.051192
63	12.7	1.530864	5.431157	9.9	1.092593	3.876269
125	24.2	4.666667	16.55627	21.5	2.925926	10.38052
500	11.7	10.64198	37.75530	11.4	6.907407	24.50591
2000	3.4	13.53086	48.00442	1.2	9.018519	31.99565
5600	.9	14.37037	50.98280	1.7	9.240741	32.78404
sieve sum	59.1	14.59259	51.77119	51.6	9.555556	33.90093
total before sieving	59	14.56790	51.68359	51.3	9.5	33.70383

CASCADE IMPACTOR SAMPLES

c.i. cfm: .475
vac. cfm: 72
.0000267 curb-km
.0000166 curb-mi

c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.2		
0.5	0	0	0	.2	.0056140	.0199177
0.8	.1	0	0	.2	.0112281	.0398353
1.4	.6	.0037427	.0132784	.9	.0168421	.0597530
2	.6	.0261988	.0929491	1.9	.0421053	.1493825
4	1.6	.0486550	.1726198	3.6	.0954386	.3386004
11	3.3	.1085380	.3850749	2.2	.1964912	.6971184
stage 1	8.9	.2320468	.8232636	9.5	.2582456	.9162127
precutter	208.2	.5651462	2.005045	162.7	.5249123	1.862302
total	223.3	8.357427	29.65077	181.4	5.091930	18.06532

Test No: 80-06-10
Date: 01-26-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-n
Sweeper Type: as

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
strips	20	20
cm wide	13.5	13.5
curb-km	.0027	.0027
curb-mi	.0016778	.0016778

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
pan	16.2			26.7		
38	116.7	6	21.28663	30.7	9.888889	35.08352
63	66.3	49.22222	174.6292	20.2	21.25926	75.42301
125	77.4	73.77778	261.7467	16.3	28.74074	101.9656
500	52.7	102.4444	363.4495	7.6	34.77778	123.3836
2000	10.3	121.9630	432.6968	1.8	37.59259	133.3699
5600	25.8	125.7778	446.2309	.4	38.25926	135.7351
sieve sum	365.4	135.3333	480.1318	103.7	38.40741	136.2607
total before sieving	365.5	135.3704	480.2632	102.4	37.92593	134.5525

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.475	.475
vac. cfm:	72	72
curb-km	.0000178	.0000178
curb-mi	.0000111	.0000111

dia., aero.-microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
filter	0			0		
0.5	.3	0	0	.1	0	0
0.8	.7	.0168421	.0597530	.8	.0056140	.0199177
1.4	3.6	.0561404	.1991767	2.1	.0505263	.1792590
2	15	.2582456	.9162127	4.2	.1684211	.5975300
4	41	1.100351	3.903863	12.2	.4042105	1.434072
11	50.9	3.402105	12.07011	24.5	1.089123	3.864028
stage 1	65.7	6.259649	22.20820	41.4	2.464561	8.743856
precutter	1015.4	9.948070	35.29411	301.2	4.788772	16.98977
total	1192.6	66.95298	237.5381	386.5	21.69825	76.98179

Test No: 80-06-11
Date: 01-31-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-w
Sweeper Type: iss

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
10 strips	10 strips
13.5 cm wide	13.5 cm wide
.00135 curb-km	.00135 curb-km
.0008389 curb-mi	.0008389 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	5.3			4.6		
38	20.7	3.925926	13.92829	16.3	3.407407	12.08870
63	93.3	19.25926	68.32746	68.8	15.48148	54.92477
125	756.2	88.37037	313.5179	435.6	66.44444	235.7297
500	59.8	648.5185	2300.796	32.3	389.1111	1380.478
2000	3.6	692.8148	2457.949	.9	413.0370	1465.361
5600	2	695.4815	2467.410	.2	413.7037	1467.726
sieve sum	940.9	696.9630	2472.666	558.7	413.8519	1468.252
total before sieving	941.2	697.1852	2473.454	559	414.0741	1469.040

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000089 curb-km	.0000089 curb-km
.0000055 curb-mi	.0000055 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.1			.2		
0.5	.1	.0112281	.0398353	.4	.0224561	.0796707
0.8	1.1	.0224561	.0796707	.8	.0673684	.2390120
1.4	6.8	.1459649	.5178594	1.6	.1571930	.5576947
2	11.3	.9094737	3.226662	4.4	.3368421	1.195060
4	22.8	2.178246	7.728055	15.5	.8308772	2.947815
11	29.5	4.738246	16.81051	24.8	2.571228	9.122292
stage 1	20.8	8.050526	28.56194	23.1	5.355789	19.00146
precutter	2073.1	10.38596	36.84769	1106.1	7.949474	28.20342
total	2165.6	243.1551	862.6740	1176.9	132.1432	468.8221

Test No: 80-07-01
Date: 02-01-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-s
Sweeper Type: iss

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

Initial:
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

Residual:
60 strips
13.5 cm wide
.0081 curb-km
.0050333 curb-mi

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
pan	2.7			7.5		
38	7.8	1	3.547772	6.9	.9259259	3.284974
63	23.7	3.888889	13.79689	11.8	1.777778	6.307150
125	42	12.66667	44.93845	19.6	3.234568	11.47551
500	13.3	28.22222	100.1260	7.3	5.654321	20.06024
2000	2.2	33.14815	117.6021	2.3	6.555556	23.25762
5600	4.2	33.96296	120.4928	0	6.839506	24.26501
sieve sum	95.9	35.51852	126.0116	55.4	6.839506	24.26501
total before sieving	95.5	35.37037	125.4860	55.5	6.851852	24.30881

CASCADE IMPACTOR SAMPLES

Initial:
c.i. cfm: .475
vac. cfm: 72
.0000178 curb-km
.0000111 curb-mi

Residual:
c.i. cfm: .475
vac. cfm: 72
.0000534 curb-km
.0000332 curb-mi

dia., aero.-microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
filter	.1			.2		
0.5	.5	.0056140	.0199177	.3	.0037427	.0132784
0.8	.4	.0336842	.1195060	.3	.0093567	.0331961
1.4	.7	.0561404	.1991767	.8	.0149708	.0531138
2	1.9	.0954386	.3386004	2.6	.0299415	.1062276
4	2.6	.2021053	.7170360	4.3	.0785965	.2788474
11	10	.3480702	1.234895	10.4	.1590643	.5643339
stage 1	9.5	.9094737	3.226662	15.5	.3536842	1.254813
precutter	309.7	1.442807	5.118841	170	.6437427	2.283893
total	335.4	18.82947	66.80386	204.4	3.825029	13.57057

Test No: 80-07-02
Date: 02-09-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-s
Sweeper Type: iss

INITIAL — RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	40 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0054 curb-km
.0016778 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	2			5.4		
38	4.2	.7407407	2.627979	5.5	1	3.547772
63	12.3	2.296296	8.146736	9.5	2.018519	7.161244
125	33.7	6.851852	24.30881	15.2	3.777778	13.40269
500	13.2	19.33333	68.59026	5.5	6.592593	23.38902
2000	3.6	24.22222	85.93492	1.5	7.611111	27.00249
5600	1.3	25.55556	90.66529	1	7.888889	27.98798
sieve sum	70.3	26.03704	92.37347	43.6	8.074074	28.64497
total before sieving	70.4	26.07407	92.50487	43.8	8.111111	28.77637

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000178 curb-km	.0000356 curb-km
.0000111 curb-mi	.0000221 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			0		
0.5	0	0	0	-.3	0	0
0.8	.1	0	0	-.7	-.008421	-.029877
1.4	.2	.0056140	.0199177	-1.2	-.028070	-.099588
2	.9	.0168421	.0597530	-2.9	-.061754	-.219094
4	1.3	.0673684	.2390120	-6.2	-.143158	-.507901
11	5.8	.1403509	.4979417	-4.3	-.317193	-1.12535
stage 1	9.2	.4659649	1.653166	-21.2	-.437895	-1.55358
precutter	241.8	.9824561	3.485592	-1.6	-1.03298	-3.66485
total	259.3	14.55719	51.64651	-38.4	-1.07789	-3.82419

- means that this sample spilled during processing and lost some wt

Test No: 80-07-03
Date: 02-10-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-w
Sweeper Type: as

INITIAL | RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
10 strips	20 strips
13.5 cm wide	13.5 cm wide
.00135 curb-km	.0027 curb-km
.000838 9 curb-mi	.0016778 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	4.1			5.9		
38	14.7	3.037037	10.77472	12.8	2.185185	7.752539
63	63.4	13.92593	49.40601	41	6.925926	24.57161
125	628.2	60.88889	216.0199	200.9	22.11111	78.44518
500	36.3	526.2222	1866.916	5.8	96.51852	342.4257
2000	2.5	553.1111	1962.312	.1	98.66667	350.0468
5600	1.8	554.9630	1968.882	.9	98.70370	350.1782
sieve sum	751	556.2963	1973.612	267.4	99.03704	351.3608
total before sieving	752.4	557.3333	1977.292	268.2	99.33333	352.4120

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000089 curb-km	.0000178 curb-km
.0000055 curb-mi	.0000111 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.3		
0.5	.2	0	0	.1	.0168421	.0597530
0.8	.4	.0224561	.0796707	.4	.0224561	.0796707
1.4	.7	.0673684	.2390120	.9	.0449123	.1593413
2	2	.1459649	.5178594	2	.0954386	.3386004
4	9.9	.3705263	1.314566	5.1	.2077193	.7369537
11	29.7	1.482105	5.258264	15.2	.4940351	1.752755
stage 1	23	4.816842	17.08936	23.6	1.347368	4.780240
precutter	2558.3	7.399298	26.25149	894.5	2.672281	9.480810
total	2624.2	294.6470	1045.359	942.1	52.88982	187.6443

Test No: 80-07-04
Date: 02-14-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-w
Sweeper Type: bsb

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

Initial:
10 strips
13.5 cm wide
.00135 curb-km
.000838 9 curb-mi

Residual:
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

	INITIAL			RESIDUAL		
dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	11.6			10.4		
38	17.2	8.592593	30.48456	17.3	3.851852	13.66549
63	53.4	21.33333	75.68580	43.8	10.25926	36.39751
125	323.4	60.88889	216.0199	109.2	26.48148	93.95026
500	27.7	300.4444	1065.908	3.3	66.92593	237.4379
2000	1.8	320.9630	1138.703	.8	68.14815	241.7741
5600	0	322.2963	1143.434	1.8	68.44444	242.8253
sieve sum	435.1	322.2963	1143.434	186.6	69.11111	245.1905
total before sieving	434.8	322.0741	1142.645	186.3	69	244.7963

CASCADE IMPACTOR SAMPLES

Initial:
c.i. cfm: .475
vac. cfm: 72
.0000089 curb-km
.0000055 curb-mi

Residual:
c.i. cfm: .475
vac. cfm: 72
.0000178 curb-km
.0000111 curb-mi

	INITIAL			RESIDUAL		
dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.3		
0.5	0	0	0	.3	.0168421	.0597530
0.8	.5	0	0	.4	.0336842	.1195060
1.4	1.5	.0561404	.1991767	1	.0561404	.1991767
2	2.8	.2245614	.7967067	3.3	.1122807	.3983534
4	8.5	.5389474	1.912096	8	.2975439	1.055636
11	28.3	1.493333	5.298100	21.4	.7466667	2.649050
stage 1	28.5	4.670877	16.57150	35.8	1.948070	6.911431
precutter	1564.5	7.870877	27.92457	632.1	3.957895	14.04196
total	1634.6	183.5340	651.1484	702.6	39.44421	139.9415

Test No: 80-07-05
Date: 02-15-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-e
Sweeper Type: iss

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	Initial	Residual
strips	10	40
cm wide	13.5	13.5
curb-km	.00135	.0054
curb-mi	.0008389	.0033556

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	5.6			5.5		
38	17.6	4.148148	14.71668	14.7	1.018519	3.613472
63	102.7	17.18519	60.96912	29.2	3.740741	13.27130
125	1162.3	93.25926	330.8626	63.6	9.148148	32.45554
500	44.8	954.2222	3385.363	4	20.92593	74.24041
2000	7	987.4074	3503.096	2.6	21.66667	76.86839
5600	4.5	992.5926	3521.492	2.8	22.14815	78.57658
sieve sum	1344.5	995.9259	3533.318	122.4	22.66667	80.41617
total before sieving	1340.7	993.1111	3523.332	121.8	22.55556	80.02197

CASCADE IMPACTOR SAMPLES

	Initial	Residual
c.i. cfm:	.475	.475
vac. cfm:	72	72
curb-km	.0000089	.0000356
curb-mi	.0000055	.0000221

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.3			0		
0.5	.2	.0336842	.1195060	.5	0	0
0.8	.2	.0561404	.1991767	.9	.0140351	.0497942
1.4	.8	.0785965	.2788474	2.4	.0392982	.1394237
2	3.2	.1684211	.5975300	5.4	.1066667	.3784357
4	13	.5277193	1.872261	10.2	.2582456	.9162127
11	46.2	1.987368	7.050854	9.5	.5445614	1.932014
stage 1	34.1	7.174737	25.45478	30.8	.8112281	2.878103
precutter	3581.4	11.00351	39.03863	347.6	1.675789	5.945424
total	3679.4	413.1256	1465.701	407.3	11.43298	40.56233

Test No: 80-07-06
Date: 02-16-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: moren-s
Sweeper Type: as

INITIAL | RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL:
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

RESIDUAL:
30 strips
13.5 cm wide
.00405 curb-km
.0025167 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	4			1.8		
38	6.2	1.481481	5.255959	2.5	.4444444	1.576788
63	9.6	3.777778	13.40269	5	1.061728	3.766770
125	23.1	7.333333	26.01699	12	2.296296	8.146736
500	16.6	15.88889	56.37016	4.4	5.259259	18.65865
2000	2.8	22.03704	78.18238	.4	6.345679	22.51302
5600	0	23.07407	81.86155	.5	6.444444	22.86342
sieve sum	62.3	23.07407	81.86155	26.6	6.567901	23.30142
total before sieving	62.2	23.03704	81.73016	26.5	6.543210	23.21382

CASCADE IMPACTOR SAMPLES

INITIAL:
c.i. cfm: .475
vac. cfm: 72
.0000178 curb-km
.0000111 curb-mi

RESIDUAL:
c.i. cfm: .475
vac. cfm: 72
.0000267 curb-km
.0000166 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.5	.1	.0056140	.0199177	0	0	0
0.8	.2	.0112281	.0398353	.4	0	0
1.4	.4	.0224561	.0796707	.5	.0149708	.0531138
2	1.3	.0449123	.1593413	.7	.0336842	.1195060
4	2.7	.1178947	.4182710	1.6	.0598830	.2124551
11	6.8	.2694737	.9560481	2.5	.1197661	.4249102
stage 1	11.5	.6512281	2.310449	5.2	.2133333	.7568714
precutter	147.6	1.296842	4.600981	73.3	.4079532	1.447351
total	170.7	9.583158	33.99946	84.2	3.151345	11.18045

Test No: 80-07-07
Date: 02-17-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-w
Sweeper Type: as

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	40 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0054 curb-km
.0016778 curb-mi	.0033556 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	7.9			7.2		
38	18.7	2.925926	10.38052	19.1	1.333333	4.730363
63	57.7	9.851852	34.95212	56.6	4.870370	17.27896
125	197.1	31.22222	110.7693	119.5	15.35185	54.46487
500	10.1	104.2222	369.7567	3.1	37.48148	132.9758
2000	1.3	107.9630	383.0280	.7	38.05556	135.0124
5600	1.2	108.4444	384.7362	.1	38.18519	135.4723
sieve sum	294	108.8889	386.3130	206.3	38.20370	135.5380
total before sieving	294	108.8889	386.3130	205.9	38.12963	135.2752

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000178 curb-km	.0000356 curb-km
.0000111 curb-mi	.0000221 curb-mi

		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	0			.3		
0.5	0	0	0	.1	.0084211	.0298765
0.8	.4	0	0	.5	.0112281	.0398353
1.4	.6	.0224561	.0796707	1.4	.0252632	.0896295
2	1.8	.0561404	.1991767	3.7	.0645614	.2290532
4	5.3	.1571930	.5576947	9.8	.1684211	.5975300
11	25	.4547368	1.613331	31.2	.4435088	1.573496
stage 1	27.4	1.858246	6.592748	33.2	1.319298	4.680652
precutter	1068	3.396491	12.05019	638.9	2.251228	7.986985
total	1128.5	63.35439	224.7709	719.1	20.18526	71.61398

Test No: 80-07-08
Date: 02-18-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-e
Sweeper Type: bsa

INITIAL | RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
	10 strips	15 strips
	13.5 cm wide	13.5 cm wide
	.00135 curb-km	.002025 curb-km
	.0008389 curb-mi	.0012583 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	8.1			4.5		
38	9.7	6	21.28663	6.7	2.222222	7.883938
63	64.5	13.18519	46.77803	39	5.530864	19.62225
125	511.9	60.96296	216.2827	230.7	24.79012	87.94971
500	14.8	440.1481	1561.545	6.1	138.7160	492.1329
2000	3.3	451.1111	1600.439	1.9	141.7284	502.8200
5600	5.4	453.5556	1609.112	1.3	142.6667	506.1488
sieve sum	617.7	457.5556	1623.303	290.2	143.3086	508.4264
total before sieving	617.7	457.5556	1623.303	289.7	143.0617	507.5504

CASCADE IMPACTOR SAMPLES

	INITIAL		RESIDUAL	
c.i. cfm:	.475		.475	
vac. cfm:	72		72	
	.0000089	curb-km	.0000134	curb-km
	.0000055	curb-mi	.0000083	curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.5	0	.0112281	.0398353	.2	0	0
0.8	.1	.0112281	.0398353	.2	.0149708	.0531138
1.4	.4	.0224561	.0796707	.4	.0299415	.1062276
2	.8	.0673684	.2390120	1.5	.0598830	.2124551
4	2.6	.1571930	.5576947	2.9	.1721637	.6108085
11	19.5	.4491228	1.593413	7	.3892398	1.380958
stage 1	21.8	2.638596	9.361304	14.9	.9132164	3.239941
precutter	1888	5.086316	18.04541	848.2	2.028538	7.196917
total	1933.3	217.0723	770.1365	875.3	65.51953	232.4525

Test No: 80-07-09
Date: 02-22-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-s
Sweeper Type: bsb

VACUUM CLEANER SAMPLES

INITIAL

10 strips
13.5 cm wide
.00135 curb-km
.0008389 curb-mi

RESIDUAL

40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	1.9			4		
38	1.9	1.407407	4.993161	5.9	.7407407	2.627979
63	3.2	2.814815	9.986321	13.2	1.833333	6.504249
125	8.2	5.185185	18.39585	23.2	4.277778	15.17658
500	4.5	11.25926	39.94529	10	8.574074	30.41886
2000	.6	14.59259	51.77119	2.1	10.42593	36.98881
5600	0	15.03704	53.34798	.5	10.81481	38.36850
sieve sum	20.3	15.03704	53.34798	58.9	10.90741	38.69699
total before sieving	20.3	15.03704	53.34798	58.7	10.87037	38.56560

CASCADE IMPACTOR SAMPLES

INITIAL

c.i. cfm: .475
vac. cfm: 72
.0000089 curb-km
.0000055 curb-mi

RESIDUAL

c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.3			0		
0.5	0	.0336842	.1195060	.1	0	0
0.8	0	.0336842	.1195060	.4	.0028070	.0099588
1.4	.2	.0336842	.1195060	.7	.0140351	.0497942
2	.4	.0561404	.1991767	1.9	.0336842	.1195060
4	.3	.1010526	.3585180	3.1	.0870175	.3087239
11	1.5	.1347368	.4780240	6.8	.1740351	.6174477
stage 1	5.5	.3031579	1.075554	19.1	.3649123	1.294648
precutter	33.5	.9207018	3.266498	156	.9010526	3.196786
total	41.7	4.682105	16.61134	188.1	5.28	18.73257

Test No: 80-07-10
Date: 02-23-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-n
Sweeper Type: iss

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
5 strips	40 strips
13.5 cm wide	13.5 cm wide
.000675 curb-km	.0054 curb-km
.0004194 curb-mi	.0033556 curb-mi

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
pan	65.9			57.7		
38	69.6	97.62963	346.3677	33.3	10.68519	37.90860
63	69.3	200.7407	712.1824	42	16.85185	59.78653
125	107.7	303.4074	1076.420	54	24.62963	87.38031
500	108.5	462.9630	1642.487	39.6	34.62963	122.8580
2000	40	623.7037	2212.759	6.8	41.96296	148.8750
5600	7.4	682.9630	2422.997	4	43.22222	153.3426
sieve sum	468.4	693.9259	2461.891	237.4	43.96296	155.9706
total before sieving	470.7	697.3333	2473.980	236.4	43.77778	155.3136

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.475	c.i. cfm:	.475
vac. cfm:	72	vac. cfm:	72
.0000045 curb-km		.0000356 curb-km	
.0000028 curb-mi		.0000221 curb-mi	

dia., aero.-microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
filter	.1			.1		
0.5	.2	.0224561	.0796707	.6	.0028070	.0099588
0.8	1.7	.0673684	.2390120	2.7	.0196491	.0697118
1.4	5.4	.4491228	1.593413	6.3	.0954386	.3386004
2	13.6	1.661754	5.895630	12.5	.2722807	.9660069
4	31.4	4.715789	16.73084	26	.6231579	2.210861
11	68.5	11.76702	41.74743	40.7	1.352982	4.800158
stage 1	149.5	27.14947	96.32184	75.9	2.495439	8.853403
precutter	1281.5	60.72140	215.4295	729.7	4.625965	16.41216
total	1551.9	348.4968	1236.409	894.5	25.10877	89.08177

```
        Test No:  80-13-01
           Date:   8-16-83
    Sample Type: [     x    ] 8 ft. Sweeping Lane
                 [          ] Half of Street
       Location:  mission-e
   Sweeper Type:  bsb


                      INITIAL                          RESIDUAL

                              VACUUM CLEANER SAMPLES
                            5 strips                          30 strips
                         13.5 cm wide                       13.5 cm wide
                      .000675 curb-km                     .00405 curb-km
                     .0004194 curb-mi                   .0025167 curb-mi

                      ----cumulative----                  ----cumulative----
               sieve  ---smaller than---          sieve   ---smaller than---
 dia.,          wt.,  kg/       lb/                wt.,   kg/       lb/
 microns         g      curb-km  curb-mi            g       curb-km  curb-mi

 pan            7.9                              11.3
 38             9.7 11.70370 41.52207            28.3 2.790123 9.898722
 63            39.8 26.07407 92.50487            77.5 9.777778 34.68933
 125          249.4 85.03704 301.6920           224.8 28.91358 102.5788
 500             24 454.5185 1612.528            15.3 84.41975 299.5020
 2000           2.4 490.0741 1738.671             2.6 88.19753 312.9047
 5600           2.3 493.6296 1751.285              .8 88.83951 315.1823
 sieve sum    335.5 497.0370 1763.374           360.6 89.03704 315.8831
 total        335.5 497.0370 1763.374           360.1 88.91358 315.4451
  before
  sieving

                            CASCADE IMPACTOR SAMPLES
                     c.i. cfm:      .408                c.i. cfm:      .404
                     vac. cfm:        72                vac. cfm:        72
                      .0000038 curb-km                   .0000227 curb-km
                      .0000024 curb-mi                   .0000141 curb-mi

                     ----cumulative----                  ----cumulative----
 dia.,        stage  ---smaller than---         stage    ---smaller than---
 aero.-        wt.,  kg/       lb/               wt.,    kg/       lb/
 microns        mg     curb-km  curb-mi           mg       curb-km  curb-mi

 filter          .1                                0
 0.5              0 .0261438 .0927538             .1         0        0
 0.8              0 .0261438 .0927538             .9 .0044004 .0156120
 1.4             .8 .0261438 .0927538            1.8 .0440044 .1561203
 2                2 .2352941 .8347846            5.1 .1232123 .4371369
 4                3 .7581699 2.689862            6.8 .3476348 1.233351
 11             8.9 1.542484 5.472477           22.2 .6468647 2.294969
 stage 1       13.9 3.869281 13.72757           32.8 1.623762 5.760840
 precutter    957.1 7.503268 26.62035          796.5 3.067107 10.88159
 total        985.8 257.7255 914.3674          866.2 38.11661 135.2314
```

Test No: 80-13-02
Date: 08-17-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-s
Sweeper Type: bsb

INITIAL — RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	40 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0054 curb-km
.0016778 curb-mi	.0033556 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	14.1			14.5		
38	16.4	5.222222	18.52725	19.9	2.685185	9.526425
63	40.3	11.29630	40.07668	57.6	6.370370	22.60062
125	86.7	26.22222	93.03047	152.2	17.03704	60.44352
500	33.7	58.33333	206.9534	56.4	45.22222	160.4381
2000	10.1	70.81481	251.2348	14.1	55.66667	197.4926
5600	4.5	74.55556	264.5061	8.5	58.27778	206.7563
sieve sum	205.8	76.22222	270.4191	323.2	59.85185	212.3407
total before sieving	205.8	76.22222	270.4191	323	59.81481	212.2093

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000178 curb-km	.0000356 curb-km
.0000111 curb-mi	.0000221 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.3			.3		
0.5	.2	.0168421	.0597530	.4	.0084211	.0298765
0.8	.3	.0280702	.0995883	.9	.0196491	.0697118
1.4	1.2	.0449123	.1593413	2.3	.0449123	.1593413
2	2.9	.1122807	.3983534	6.4	.1094737	.3883945
4	9.3	.2750877	.9759657	14.9	.2891228	1.025760
11	29.1	.7971930	2.828309	45.4	.7073684	2.509626
stage 1	30.7	2.430877	8.624350	45.6	1.981754	7.030937
precutter	734	4.154386	14.73907	1332.7	3.261754	11.57217
total	808	45.36140	160.9348	1448.9	40.67088	144.2935

Test No: 80-13-03
Date: 08-19-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-e
Sweeper Type: bsa

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL:
15 strips
13.5 cm wide
.002025 curb-km
.0012583 curb-mi

RESIDUAL:
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL ----cumulative---- ---smaller than--- lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL ----cumulative---- ---smaller than--- lb/ curb-mi
pan	7.8			2.8		
38	16.1	3.851852	13.66549	20.2	.5185185	1.839585
63	64.1	11.80247	41.87247	108.6	4.259259	15.11088
125	368.9	43.45679	154.1748	330.3	24.37037	86.46052
500	40.1	225.6296	800.4825	23.5	85.53704	303.4659
2000	4.3	245.4321	870.7371	3.1	89.88889	318.9053
5600	2.6	247.5556	878.2707	2.2	90.46296	320.9420
sieve sum	503.9	248.8395	882.8258	490.7	90.87037	322.3874
total before sieving	504.7	249.2346	884.2274	491.4	91	322.8473

CASCADE IMPACTOR SAMPLES

INITIAL:
c.i. cfm: .475
vac. cfm: 72
.0000134 curb-km
.0000083 curb-mi

RESIDUAL:
c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

dia., aero.- microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL ----cumulative---- ---smaller than--- lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL ----cumulative---- ---smaller than--- lb/ curb-mi
filter	0			0		
0.5	.3	0	0	.1	0	0
0.8	.3	.0224561	.0796707	1	.0028070	.0099588
1.4	1.5	.0449123	.1593413	1.5	.0308772	.1095472
2	4.3	.1571930	.5576947	5.7	.0729825	.2589297
4	10.1	.4790643	1.699641	16.5	.2329825	.8265832
11	28.2	1.235088	4.381887	40.3	.6961404	2.469791
stage 1	28.4	3.345965	11.87093	30.3	1.827368	6.483201
precutter	0	5.471813	19.41309	0	2.677895	9.500728
total	73.1	5.471813	19.41309	95.4	2.677895	9.500728

*** Precutter samples were lost. ***

Test No: 80-13-04
Date: 08-22-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-w
Sweeper Type: iss

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL:
15 strips
13.5 cm wide
.002025 curb-km
.0012583 curb-mi

RESIDUAL:
30 strips
13.5 cm wide
.00405 curb-km
.0025167 curb-mi

	INITIAL	----cumulative---- ---smaller than---		RESIDUAL	----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	5.5			3.7		
38	30.3	2.716049	9.635924	19.5	.9135802	3.241174
63	98.9	17.67901	62.72111	54.9	5.728395	20.32304
125	313	66.51852	235.9925	135.7	19.28395	68.41506
500	44.6	221.0864	784.3642	12.7	52.79012	187.2873
2000	2.4	243.1111	862.5028	.5	55.92593	198.4124
5600	1.5	244.2963	866.7076	.8	56.04938	198.8504
sieve sum	496.2	245.0370	869.3355	227.8	56.24691	199.5512
total before sieving	496.3	245.0864	869.5107	227.6	56.19753	199.3760

CASCADE IMPACTOR SAMPLES

INITIAL:
c.i. cfm: .475
vac. cfm: 72
.0000134 curb-km
.0000083 curb-mi

RESIDUAL:
c.i. cfm: .475
vac. cfm: 72
.0000267 curb-km
.0000166 curb-mi

	INITIAL	----cumulative---- ---smaller than---		RESIDUAL	----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.2			.1		
0.5	.3	.0149708	.0531138	.3	.0037427	.0132784
0.8	1.2	.0374269	.1327845	1.2	.0149708	.0531138
1.4	3.1	.1272515	.4514671	3.5	.0598830	.2124551
2	8.8	.3592982	1.274731	8.9	.1908772	.6772007
4	23	1.018012	3.611737	18.8	.5239766	1.858982
11	10.2	2.739649	9.719822	44	1.227602	4.355330
stage 1	47	3.503158	12.42862	41.6	2.874386	10.19785
precutter	2265.4	7.021287	24.91036	1123.4	4.431345	15.72168
total	2359.2	176.5951	626.5302	1241.8	46.47673	164.8917

Test No: 80-13-05
Date: 08-23-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-s
Sweeper Type: bsb

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL:
20 strips
13.5 cm wide
.0027 curb-km
.0016778 curb-mi

RESIDUAL:
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

dia., microns	INITIAL sieve wt., g	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL sieve wt., g	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
pan	1.1			1.7		
38	5.9	.4074074	1.445389	11.3	.3148148	1.116891
63	18.3	2.592593	9.197927	39.2	2.407407	8.540933
125	56.7	9.370370	33.24394	83.6	9.666667	34.29513
500	27.1	30.37037	107.7472	28.8	25.14815	89.21990
2000	3.7	40.40741	143.3563	8.3	30.48148	108.1413
5600	.9	41.77778	148.2180	2.7	32.01852	113.5944
sieve sum	113.7	42.11111	149.4006	175.6	32.51852	115.3683
total before sieving	113.4	42	149.0064	174.6	32.33333	114.7113

CASCADE IMPACTOR SAMPLES

INITIAL:
c.i. cfm: .475
vac. cfm: 72
.0000178 curb-km
.0000111 curb-mi

RESIDUAL:
c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

dia., aero.- microns	INITIAL stage wt., mg	INITIAL ----cumulative---- ---smaller than--- kg/ curb-km	INITIAL lb/ curb-mi	RESIDUAL stage wt., mg	RESIDUAL ----cumulative---- ---smaller than--- kg/ curb-km	RESIDUAL lb/ curb-mi
filter	.1			.1		
0.5	.2	.0056140	.0199177	.1	.0028070	.0099588
0.8	.3	.0168421	.0597530	.7	.0056140	.0199177
1.4	.7	.0336842	.1195060	2	.0252632	.0896295
2	2.1	.0729825	.2589297	5.5	.0814035	.2888062
4	4.9	.1908772	.6772007	12.7	.2357895	.8365421
11	11.1	.4659649	1.653166	29	.5922807	2.101314
stage 1	17.6	1.089123	3.864028	33.5	1.406316	4.989376
precutter	565.7	2.077193	7.369537	722.8	2.346667	8.325585
total	602.7	33.83579	120.0438	806.4	22.63579	80.30804

Test No: 80-13-06
Date: 08-24-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: mission-w
Sweeper Type: as

INITIAL

RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
20 strips	40 strips
13.5 cm wide	13.5 cm wide
.0027 curb-km	.0054 curb-km
.0016778 curb-mi	.0033556 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	3.5			12.3		
38	22.2	1.296296	4.598964	33.3	2.277778	8.081036
63	62.4	9.518519	33.76953	59	8.444444	29.95896
125	145.1	32.62963	115.7625	103	19.37037	68.72166
500	15.7	86.37037	306.4224	10	38.44444	136.3921
2000	1	92.18519	327.0520	2.5	40.29630	142.9621
5600	0	92.55556	328.3660	1	40.75926	144.6046
sieve sum	249.9	92.55556	328.3660	221.1	40.94444	145.2616
total before sieving	249.5	92.40741	327.8404	220.7	40.87037	144.9988

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .475	c.i. cfm: .475
vac. cfm: 72	vac. cfm: 72
.0000178 curb-km	.0000356 curb-km
.0000111 curb-mi	.0000221 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	0			.1		
0.5	.3	0	0	.3	.0028070	.0099588
0.8	.8	.0168421	.0597530	.9	.0112281	.0398353
1.4	2.9	.0617544	.2190943	3	.0364912	.1294648
2	6.7	.2245614	.7967067	8.3	.1207018	.4282299
4	18	.6007018	2.131190	21	.3536842	1.254813
11	29.7	1.611228	5.716371	51.8	.9431579	3.346168
stage 1	31.5	3.278596	11.63192	41.7	2.397193	8.504844
precutter	1076	5.047018	17.90598	1005.6	3.567719	12.65768
total	1165.9	65.45404	232.2201	1132.7	31.79509	112.8037

Test No: 80-13-07
Date: 09-02-83
Sample Type: [x] 8 ft. Sweeping Lane
[ ] Half of Street
Location: morena-s
Sweeper Type: iss

VACUUM CLEANER SAMPLES

INITIAL
40 strips
13.5 cm wide
.0054 curb-km
.0033556 curb-mi

RESIDUAL
60 strips
13.5 cm wide
.0081 curb-km
.0050333 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	2.1			7.5		
38	15.5	.3888889	1.379689	9	.9259259	3.284974
63	56.2	3.259259	11.56311	16.6	2.037037	7.226943
125	187.1	13.66667	48.48622	33.4	4.086420	14.49769
500	79.5	48.31481	171.4099	11.3	8.209877	29.12677
2000	10.8	63.03704	223.6410	2.6	9.604938	34.07613
5600	4.6	65.03704	230.7366	1.2	9.925926	35.21492
sieve sum	355.8	65.88889	233.7588	81.6	10.07407	35.74052
total before sieving	355.1	65.75926	233.2989	81.4	10.04938	35.65292

CASCADE IMPACTOR SAMPLES

INITIAL
c.i. cfm: .475
vac. cfm: 72
.0000356 curb-km
.0000221 curb-mi

RESIDUAL
c.i. cfm: .475
vac. cfm: 72
.0000534 curb-km
.0000332 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.1			0		
0.5	.2	.0028070	.0099588	.4	0	0
0.8	.7	.0084211	.0298765	.9	.0074854	.0265569
1.4	1.6	.0280702	.0995883	2	.0243275	.0863099
2	4.7	.0729825	.2589297	4.7	.0617544	.2190943
4	10.4	.2049123	.7269949	8.7	.1497076	.5311378
11	31.7	.4968421	1.762714	14.7	.3125146	1.108750
stage 1	39	1.386667	4.919664	24.2	.5876023	2.084716
precutter	1296.1	2.481404	8.803609	374.9	1.040468	3.691408
total	1384.5	38.86316	137.8801	430.5	8.056140	28.58185

APPENDIX F -- A.P.T. SAMPLER DATA

BELLEVUE RUNS 1 THROUGH 7

project 80, run no. 1a hs date 1 Sep 82
Half Street samples, 22.25 ft. strips, APT sampler
location:S. E. 30th St. #1
sweeper type: broom

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	APT1 bef	APT1 aft
strips	10	20
cm wide	6	6
curb-km	.0006	.0012
curb-mi	.0003728	.0007457

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	1.1			8.6		
37	2.6	1.833333	6.504249	14.1	7.166667	25.42570
63	11	6.166667	21.87793	40.7	18.91667	67.11202
125	25	24.5	86.92041	71.6	52.83333	187.4406
250	41.1	66.16667	234.7442	78.8	112.5	399.1244
500	41.9	134.6667	477.7666	59.4	178.1667	632.0947
1000	21.8	204.5	725.5194	24.6	227.6667	807.7094
2000	22.9	240.8333	854.4218	14	248.1667	880.4388
6300	14.9	279	989.8284	3	259.8333	921.8294
sieve sum	182.3	303.8333	1077.931	314.8	262.3333	930.6989
total before sieving	181.2	302	1071.427	314.4	262	929.5163

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.569	.65
vac. cfm:	60	50
curb-km	.0000057	.0000156
curb-mi	.0000035	.0000097

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			0		
0.4	0	0	0	0	0	0
0.7	0	0	0	.04	0	0
1.2	0	0	0	.23	.0025641	.0090970
2	0	0	0	.63	.0173077	.0614048
4	0	0	0	1.27	.0576923	.2046828
10	.04	0	0	1.93	.1391026	.4935129
stage 1	4.73	.0070299	.0249408	9.74	.2628205	.9324437
precutter	705.1	.8383128	2.974195	1111.9	.8871795	3.147566
total	709.87	124.7575	442.6189	1125.74	72.16282	256.0218

project 80, run no. 2a hs date 1 Sep 82
Half Street samples, 22.25 ft. strips, APT sampler
location:S. E. 30th St. #2
sweeper type: ISS

VACUUM CLEANER SAMPLES

INITIAL
sample no. APT2 bef
20 strips
6 cm wide
.0012 curb-km
.0007457 curb-mi

RESIDUAL
sample no. APT2 aft
20 strips
6 cm wide
.0012 curb-km
.0007457 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	10.4			40.2		
37	41	8.666667	30.74736	82	33.5	118.8504
63	121	42.83333	151.9629	223.4	101.8333	361.2815
125	225.4	143.6667	509.6966	403.6	288	1021.758
250	289.9	331.5000	1176.086	443.1	624.3333	2214.992
500	191.8	573.0833	2033.169	238.3	993.5833	3525.007
1000	64.9	732.9167	2600.221	79.3	1192.167	4229.536
2000	27.6	787.0000	2792.097	29.7	1258.25	4463.984
6300	2.4	810.0000	2873.695	.4	1283	4551.792
sieve sum	974.4	812.0000	2880.791	1540	1283.333	4552.974
total before sieving	973.4	811.1667	2877.834	1539.4	1282.833	4551.200

CASCADE IMPACTOR SAMPLES

INITIAL
c.i. cfm: .575
vac. cfm: 31
.0000223 curb-km
.0000138 curb-mi

RESIDUAL
c.i. cfm: .575
vac. cfm: 35
.0000197 curb-km
.0000123 curb-mi

	INITIAL			RESIDUAL		
		----cumulative---- ---smaller than---			----cumulative---- ---smaller than---	
dia., aero.- microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	0			.19		
0.4	0	0	0	.38	.0096377	.0341929
0.7	.49	0	0	2.03	.0289130	.1025787
1.2	1.57	.0220145	.0781038	5.74	.1318841	.4679028
2	3.68	.0925507	.3283547	13.11	.4230435	1.500888
4	5.74	.2578841	.9149300	18.19	1.088043	3.860198
10	13.15	.5157681	1.829860	45.2	2.010725	7.133718
stage 1	18.05	1.106565	3.925910	45.33	4.303478	15.26803
precutter	2793.3	1.917507	6.802999	607.2	6.602826	23.42573
total	2835.98	127.4136	452.0424	737.37	37.40283	132.6990

project 80, run no. 3a hs date 2 Sep 82
Half Street samples, 22.25 ft. strips, APT sampler
location:S. E. 30th St. #3
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	APT3 bef	APT3 aft
strips	20	20
cm wide	6	6
curb-km	.0012	.0012
curb-mi	.0007457	.0007457

dia., microns	INITIAL sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	RESIDUAL sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	5.7			7		
37	12.7	4.75	16.85192	11	5.833333	20.69534
63	48.7	15.33333	54.39917	35.1	15	53.21658
125	87.2	55.91667	198.3796	60.8	44.25	156.9889
250	105.7	128.5833	456.1844	63	94.91667	336.7427
500	78.3	216.6667	768.6839	49.9	147.4167	523.0007
1000	48.3	281.9167	1000.176	39.4	189	670.5289
2000	23.6	322.1667	1142.974	9.6	221.8333	787.0141
6300	8.7	341.8333	1212.747	.7	229.8333	815.3963
sieve sum	418.9	349.0833	1238.468	276.5	230.4167	817.4658
total before sieving	418.2	348.5	1236.399	275.6	229.6667	814.8050

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.582	.582
vac. cfm:	45	39
curb-km	.0000155	.0000179
curb-mi	.0000096	.0000111

dia., aero.-microns	INITIAL stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	RESIDUAL stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			0		
0.4	0	0	0	0	0	0
0.7	.1	0	0	.07	0	0
1.2	.18	.0064433	.0228598	.33	.0039089	.0138683
2	.48	.0180412	.0640073	1.19	.0223368	.0792472
4	.81	.0489691	.1737342	1.5	.0887887	.3150075
10	1.69	.1011598	.3588982	1.87	.1725515	.6121843
stage 1	10.07	.2100515	.7452281	5.54	.2769759	.9826648
precutter	1307.8	.8588918	3.047206	817.7	.5863402	2.080238
total	1321.13	85.12436	302.0071	828.2	46.24828	164.0813

project 80, run no. 4a hs date 3 Sep 82
Half Street samples, 16 ft. strips, APT sampler
location: Surrey Down #2
sweeper type: BROOM

VACUUM CLEANER SAMPLES

INITIAL		RESIDUAL	
			Rained Out
sample no.	APT4 bef	sample no.	none
20	strips		strips
6	cm wide		cm wide
.0012	curb-km		curb-km
.0007457	curb-mi		curb-mi

		----cumulative----			----cumulative----	
		---smaller than---			---smaller than---	
dia., microns	sieve wt., g	kg/ curb-km	lb/ curb-mi	sieve wt., g	kg/ curb-km	lb/ curb-mi
pan	7					
37	10.2	5.833333	20.69534			
63	29.8	14.33333	50.85140			
125	55.3	39.16667	138.9544			
250	73.8	85.25000	302.4476			
500	58.6	146.75	520.6355			
1000	21.3	195.5833	693.8851			
2000	7	213.3333	756.8580			
6300	2	219.1667	777.5534			
sieve sum	265	220.8333	783.4663			
total before sieving	265.2	221	784.0576			

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.571	c.i. cfm:	
vac. cfm:	50	vac. cfm:	
.0000137	curb-km		curb-km
.0000085	curb-mi		curb-mi

		----cumulative----			----cumulative----	
		---smaller than---			---smaller than---	
dia., aero.-microns	stage wt., mg	kg/ curb-km	lb/ curb-mi	stage wt., mg	kg/ curb-km	lb/ curb-mi
filter	.14					
0.4	.23	.0102160	.0362447			
0.7	.22	.0269994	.0957895			
1.2	.71	.0430531	.1527454			
2	1.74	.0948628	.3365576			
4	2.66	.2218330	.7870269			
10	3.8	.4159370	1.475676			
stage 1	7.3	.6932283	2.459459			
precutter	57.7	1.225919	4.349359			
total	74.5	5.436369	19.28734			

project 80, run no. 5a hs date 8 Sep 82
Half Street samples, 16 ft. strips, APT sampler
location: Surrey Dwn #1
sweeper type: BROOM

INITIAL	RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL	RESIDUAL
sample no. APT5 bef	sample no. APT5 aft
20 strips	20 strips
6 cm wide	6 cm wide
.0012 curb-km	.0012 curb-km
.0007457 curb-mi	.0007457 curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	2.8			3.5		
37	4.3	2.333333	8.278135	5.2	2.916667	10.34767
63	12.1	5.916667	20.99098	14.3	7.25	25.72135
125	24.8	16	56.76435	28.4	19.16667	67.99896
250	38.3	36.66667	130.0850	45.4	42.83333	151.9629
500	35	68.58333	243.3180	42.3	80.66667	286.1869
1000	13.9	97.75000	346.7947	16.7	115.9167	411.2459
2000	4.1	109.3333	387.8897	5.8	129.8333	460.6191
6300	2.3	112.75	400.0113	0	134.6667	477.7666
sieve sum	137.6	114.6667	406.8112	161.6	134.6667	477.7666
total before sieving	136.9	114.0833	404.7417	161.3	134.4167	476.8797

CASCADE IMPACTOR SAMPLES

INITIAL	RESIDUAL
c.i. cfm: .786	c.i. cfm: .778
vac. cfm: 56	vac. cfm: 53
.0000168 curb-km	.0000176 curb-km
.0000105 curb-mi	.0000109 curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.15			.2		
0.4	.09	.0089059	.0315965	.3	.0113539	.0402818
0.7	.41	.0142494	.0505544	.5	.0283847	.1007044
1.2	.41	.0385920	.1369181	.4	.0567695	.2014088
2	.77	.0629347	.2232819	.7	.0794773	.2819723
4	1.7	.1086514	.3854772	1.8	.1192159	.4229584
10	2.93	.2095844	.7435708	3	.2214010	.7854942
stage 1	4.08	.3835454	1.360756	7.9	.3917095	1.389721
precutter	695.7	.6257846	2.220180	890.1	.8401885	2.980850
total	706.24	41.93113	148.7647	904.9	51.37072	182.2548

project 80, run no. 6a hs date 10 Sep 82
Half Street samples, 15 ft. strips, APT sampler
location: Surrey Dwn #3
sweeper type: RVS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

INITIAL		RESIDUAL	
sample no.	APT6 bef	sample no.	APT6 AFT
20	strips	20	strips
6	cm wide	6	cm wide
.0012	curb-km	.0012	curb-km
.0007457	curb-mi	.0007457	curb-mi

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	.3			.5		
37	.8	.25	.8869430	.7	.4166667	1.478238
63	1.8	.9166667	3.252124	1.6	1	3.547772
125	4.4	2.416667	8.573782	2.9	2.333333	8.278135
250	10.6	6.083333	21.58228	6	4.75	16.85192
500	11.7	14.91667	52.92093	6.7	9.75	34.59078
1000	3.9	24.66667	87.51171	3.4	15.33333	54.39917
2000	1.5	27.91667	99.04197	1.6	18.16667	64.45119
6300	.2	29.16667	103.4767	.1	19.50000	69.18155
sieve sum	35.2	29.33333	104.0680	23.5	19.58333	69.47720
total before sieving	34.8	29	102.8854	22.7	18.91667	67.11202

CASCADE IMPACTOR SAMPLES

INITIAL		RESIDUAL	
c.i. cfm:	.59	c.i. cfm:	.56
vac. cfm:	50	vac. cfm:	50
.0000142	curb-km	.0000134	curb-km
.0000088	curb-mi	.0000084	curb-mi

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	0			.5		
0.4	.1	0	0	.3	.0372024	.1319879
0.7	.2	.0070621	.0250553	.2	.0595238	.2111806
1.2	.4	.0211864	.0751660	.2	.0744048	.2639758
2	.2	.0494350	.1753873	.4	.0892857	.3167709
4	.2	.0635593	.2254980	.9	.1190476	.4223613
10	.4	.0776836	.2756086	2.4	.1860119	.6599395
stage 1	1.4	.1059322	.3758299	3.8	.3645833	1.293481
precutter	172.3	.2048023	.7266045	126.8	.6473214	2.296589
total	175.2	12.37288	43.89694	135.5	10.08185	35.76872

project 80, run no. 7a hs date 10 Sep 82
Half Street samples, 16 ft. strips, APT sampler
location: Surrey Dwn #2
sweeper type: ISS

INITIAL RESIDUAL

VACUUM CLEANER SAMPLES

	INITIAL	RESIDUAL
sample no.	APT7 BEF	APT7 aft
strips	40	40
cm wide	6	6
curb-km	.0024	.0024
curb-mi	.0014914	.0014914

dia., microns	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	sieve wt., g	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
pan	3			5.9		
37	7	1.25	4.434715	6.4	2.458333	8.721606
63	24.5	4.166667	14.78238	16	5.125	18.18233
125	57.7	14.375	50.99922	23.8	11.79167	41.83415
250	93.6	38.41667	136.2936	30.4	21.70833	77.01622
500	84.6	77.41667	274.6567	31.4	34.37500	121.9547
1000	31.9	112.6667	399.7156	14.3	47.45833	168.3713
2000	8.5	125.9583	446.8715	4.2	53.41667	189.5102
6300	.5	129.5000	459.4365	.2	55.16667	195.7188
sieve sum	311.3	129.7083	460.1756	132.6	55.25	196.0144
total before sieving	310.2	129.25	458.5495	132.1	55.04167	195.2753

CASCADE IMPACTOR SAMPLES

	INITIAL	RESIDUAL
c.i. cfm:	.571	.574
vac. cfm:	40	40
curb-km	.0000343	.0000344
curb-mi	.0000213	.0000214

dia., aero.-microns	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi	stage wt., mg	----cumulative---- ---smaller than--- kg/ curb-km	lb/ curb-mi
filter	.2			.1		
0.4	.1	.0058377	.0207112	.1	.0029036	.0103015
0.7	.3	.0087566	.0310669	.2	.0058072	.0206030
1.2	.3	.0175131	.0621337	.1	.0116144	.0412060
2	.3	.0262697	.0932006	.8	.0145180	.0515075
4	.5	.0350263	.1242674	1.6	.0377468	.1339194
10	.7	.0496205	.1760455	2.1	.0842044	.2987433
stage 1	2.8	.0700525	.2485348	5	.1451800	.5150747
precutter	1999.2	.1517805	.5384921	546.8	.2903600	1.030149
total	2004.4	58.50555	207.5680	556.8	16.16725	57.35872